Heating Piping & Air Conditioning

OCTOBER 1954

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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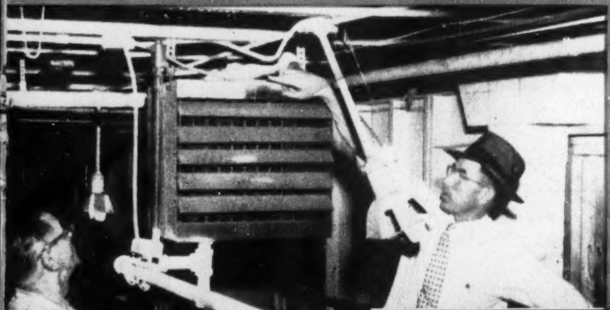

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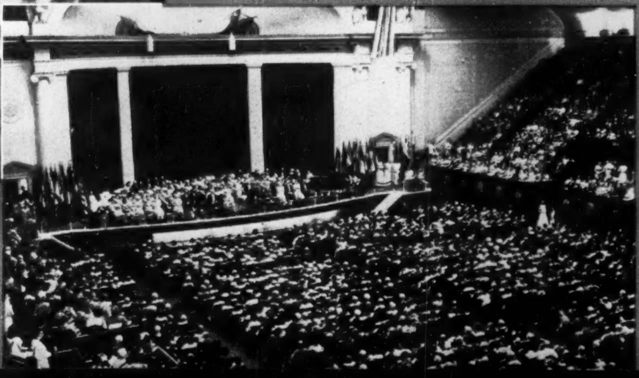

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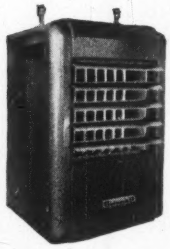
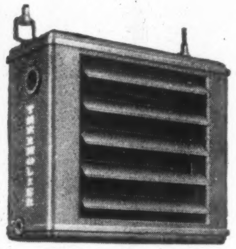
HEAT where you want it when you want it whatever the fuel you use

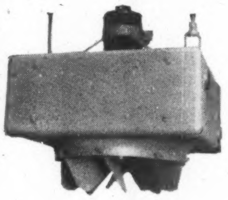
GRINNELL UNIT HEATERS



Horizontal Gas-Fired Model for natural, manufactured, mixed and LP Gases.



Horizontal Model for steam and hot water systems.



Vertical Model for steam and hot water systems.

Grinnell quality is well known. The "Grinnell" name is backed by over 60 years of heating experience. Regardless of the type and model you choose, you can depend on a Grinnell Unit Heater to give balanced heating performance plus maximum fuel economy. Call on Grinnell . . . for the unit heater to meet your specific needs.

GRINNELL
Gas-Fired Unit Heater

Available in 7 sizes — ranging from 25,000 to 200,000 Btu per hour input

Grinnell Gas-Fired Unit Heaters are easy to install, simple to operate and maintain. Efficient performance is assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit. Automatic safety pilot operates to shut off main gas supply if pilot goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. American Gas Association approved.

GRINNELL THERMOLIER
Steam/Hot Water Unit Heater

4 models . . . 18 sizes — from 35,600 to 275,300 total heat delivered, Btu per hour

Three basic models—horizontal, vertical and a special horizontal Textile model. (Adjustable velocity nozzle also available for use on horizontal models.) All models have plain thermostatic trap, the simplest and least expensive kind of a trap, made practical because of unit's exclusive internal cooling leg; maximum capacity provided and destructive water hammer eliminated by built-in pitch of tubes. Many other important features.

GRINNELL
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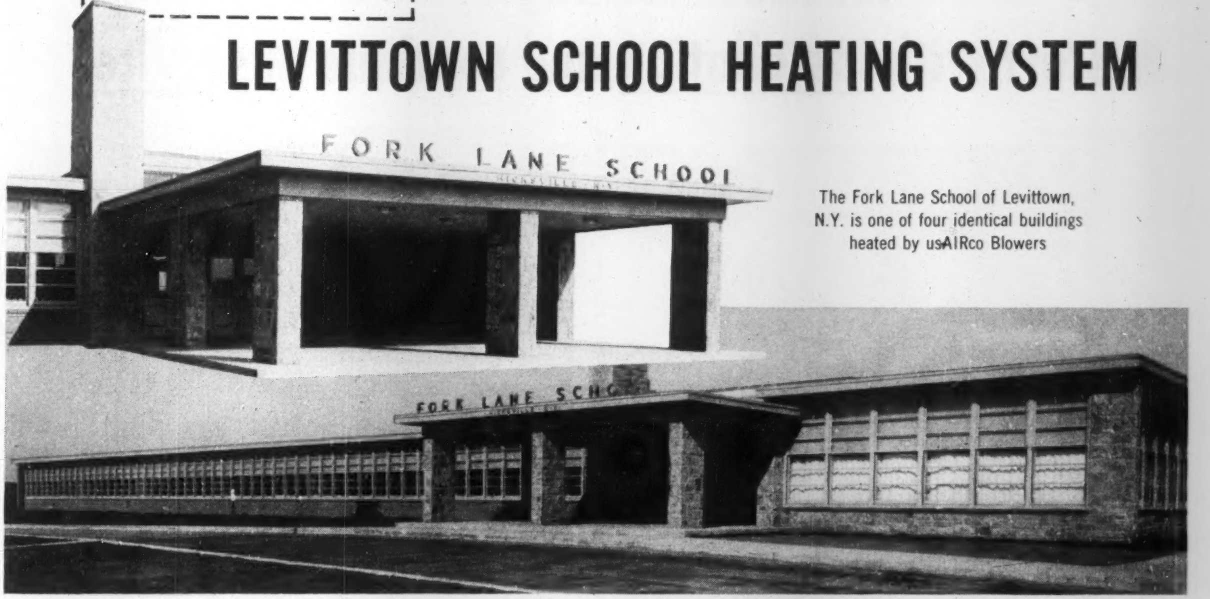
usAIRco BLOWER SYSTEM SOLVES LEVITTOWN SCHOOL HEATING SYSTEM



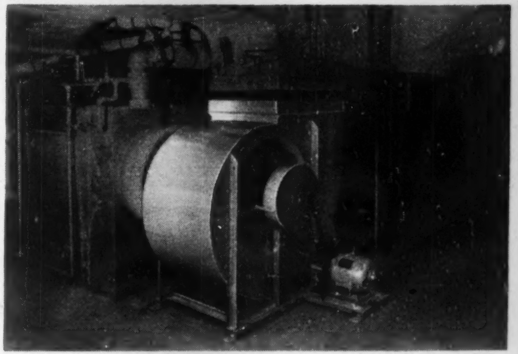
The Fork Lane School of Levittown, N.Y. is one of four identical buildings heated by usAIRco Blowers

Economy of Operation Is Deciding Factor

When last-minute budget requirements demanded a revision of heating plans in four new elementary schools in Long Island's Levittown-Hicksville area, an unusually economical and efficient warm air system was installed in all four buildings.

The identical L-shaped one-story schools were originally planned with reheat and individual control for each classroom.

To meet budget limitations, a zone system, with four or five rooms to each zone, was adopted. The central plant in each school consists of two United States Air Conditioning Corporation blowers, moving air over steam coils. One fan (handling 20,000 CFM) supplies the main classroom section of the building. The second fan (a 10,000 CFM unit) supplies the office-playroom-cafeteria wing. Blowers are forwardly curved, single inlet—single width, with counter clockwise rotation and top vertical discharge.



The main supply ducts are located in tunnels under the hallways, leading to branch ducts of concrete, buried under the masonry floor, carrying supply air to the individual rooms.

In each classroom, four vertically discharging grilles, spaced along the outside wall, blanket the glass surface with hot or tempered air. Return air is drawn out through the corridors to a large return air grille in the main hallway. An automatic damper in the return duct goes into operation after the building is up to temperature, introducing fresh air into the system.

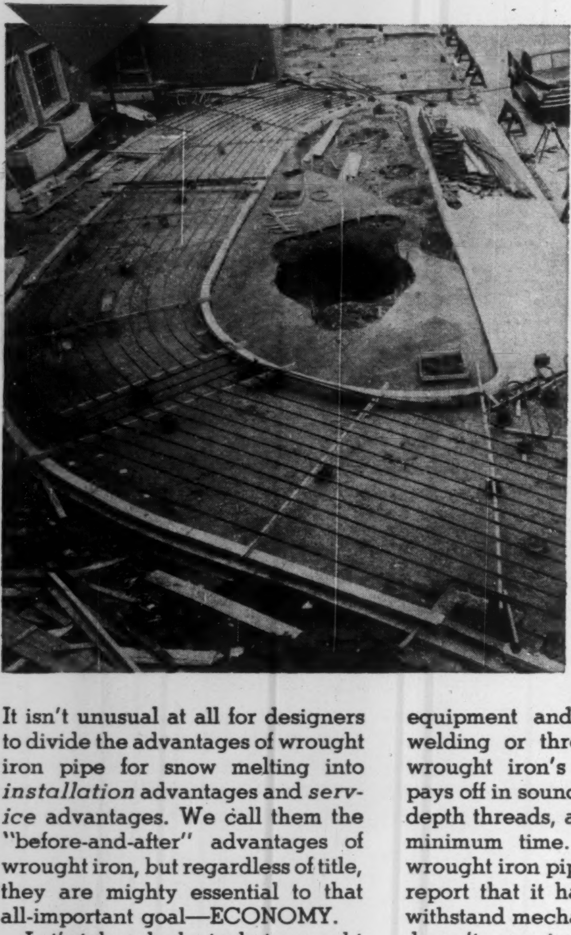
All buildings were designed by Knappe & Johnson, architects, with Albert Fentzlaff as consulting engineer and the Willner Heating Company as the heating contractor.

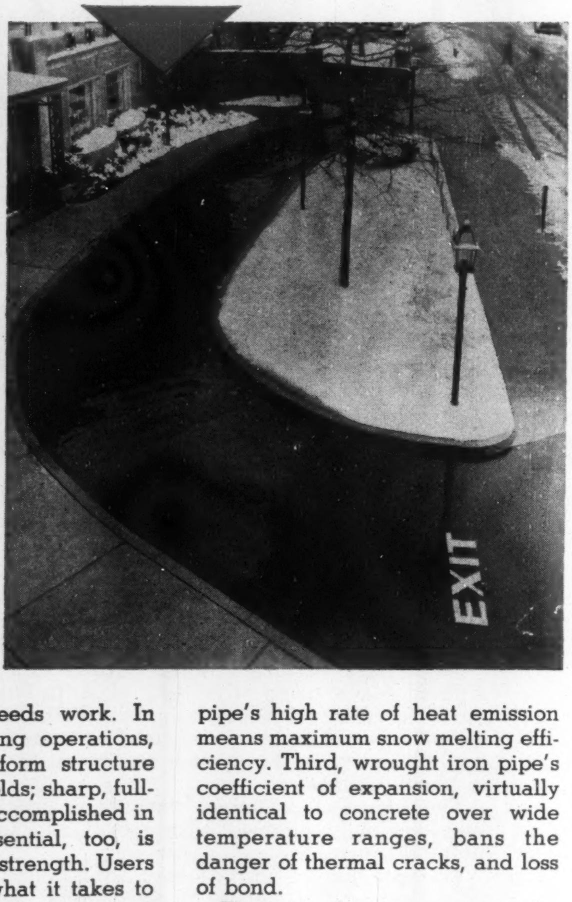
for descriptive literature on Blowers write Dept. HP 104

UNITED STATES AIR CONDITIONING CORPORATION
MINNEAPOLIS 14, MINNESOTA

usAIRco
30 YEARS OF AIR CONDITIONING

The advantages of WROUGHT IRON PIPE for snow melting systems start with installation and continue in service





It isn't unusual at all for designers to divide the advantages of wrought iron pipe for snow melting into *installation* advantages and *service* advantages. We call them the "before-and-after" advantages of wrought iron, but regardless of title, they are mighty essential to that all-important goal—ECONOMY.

Let's take a look at what wrought iron pipe means to economy during installation. It's easily formed and welded, on the job, with standard equipment. No special techniques, no extra tools are needed for a fast, dependable job. Wrought iron pipe bends true, and is free from annoying "spring-back." This feature eliminates strain on connected equipment and speeds work. In welding or threading operations, wrought iron's uniform structure pays off in sound welds; sharp, full-depth threads, all accomplished in minimum time. Essential, too, is wrought iron pipe's strength. Users report that it has what it takes to withstand mechanical damage and doesn't require the "kid-glove" treatment.

Wrought iron pipe's superior "in service" reputation is built around three big points. First, its ability to resist corrosion, serve longer at lower cost per year, is providing satisfactory, economical operation in hundreds of snow melting installations. Second, wrought iron pipe's high rate of heat emission means maximum snow melting efficiency. Third, wrought iron pipe's coefficient of expansion, virtually identical to concrete over wide temperature ranges, bans the danger of thermal cracks, and loss of bond.

There is, of course, more to the wrought iron pipe snow melting story. Our bulletin, *Wrought Iron Pipe for Snow Melting Systems,* gives complete details. Write for your copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Dept.: New York, N.Y.

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ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 26 No. 10

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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POWERS AIR CONDITIONING CONTROL

Helps hasten recovery of patients

To Provide Optimum Thermal Comfort In

Operating Rooms
Recovery and Delivery Rooms
Nurseries, X-Ray
and other spaces
in hospitals —

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for Hydrotherapy
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and Many Other Uses

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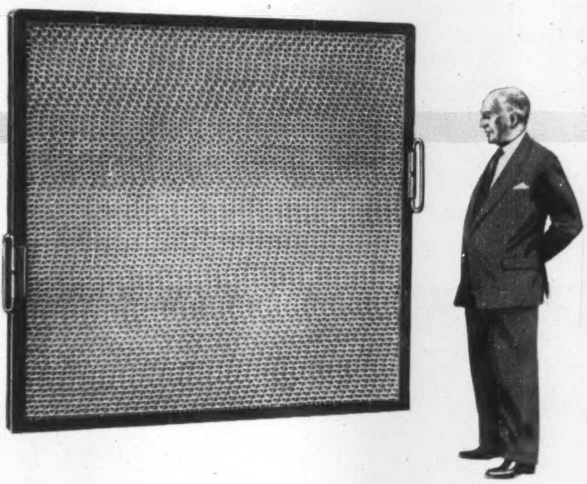

Type 68—2"—finer mesh media and tighter pack for higher efficiency on small particles.

Type 44-68—4"—double packed for special applications requiring the highest efficiency.

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Type 44—4"—for greater dirt capacity.

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Type MZ—4"—same except 4" thick.

Type C4C4—2"—all copper media and frame; for corrosion resistant water eliminators, etc.

Type C4C4—4"—same except 4" thick.

Except as noted, filters are made of zinc electroplated herringbone-crimp steel screen media in sturdy steel frames. Other materials are aluminum, stainless steel and monel. Available in all sizes.

Because one filter won't do *every* air cleaning job, Farr Company has nine standard types designed to handle practically any dirt condition. Each embodies the famous herringbone-crimp media design and other Far-Air quality features, but differs in materials, thickness, etc. When you select the type you need from the Far-Air line, you are assured of getting the most practical solution for your particular dust problem. Remember, the operating efficiency of the entire air handling system is dependent on the filters used. That is why it is important that the *right type* filters be installed. Farr field engineers will be happy to study your air cleaning problems and make specific recommendations.

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How to give your clients a new concept of indoor weather

Honeywell Customized Temperature Control is becoming a "must" in all types of modern buildings

In building design, in kitchen facilities, in picture windows and a hundred other ways—the new apartment building rising at 1000 Lake Shore Drive in Chicago will offer tenants the finest in modern city living.

And in keeping with this tradition of the finest, heating comfort will be assured by a Honeywell Customized Temperature Control installation. This will take the form of Individual Apartment Temperature Control. Each apartment will have one or more thermostats, as the floor plan indicates.

The story, in brief form, of the Honeywell Customized Temperature Control installation in the new 1000 Lake Shore Drive Apartments in Chicago is told by the pictures and captions on these two pages.

The *techniques* used, applied to your particular problems, can help you give clients the indoor Weather they've always wanted—customized to their requirements.

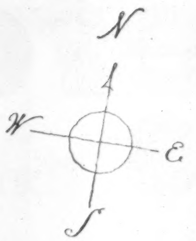
The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants* is your answer. This applies not only to heating and cooling, ventilating and humidity control, but to industrial control as well.

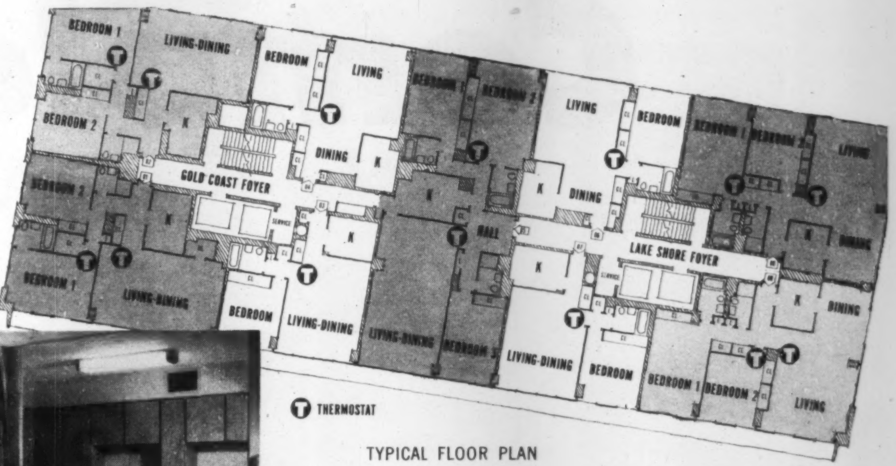
Only Honeywell can provide true "customized" control. Because only Honeywell manufactures the three types of controls—pneumatic, electric and electronic—needed for an integrated system.

NOW LEASING

Sculpture on Lake Shore Drive exterior wall, "Gold Coast" by Bernard Rosenthal

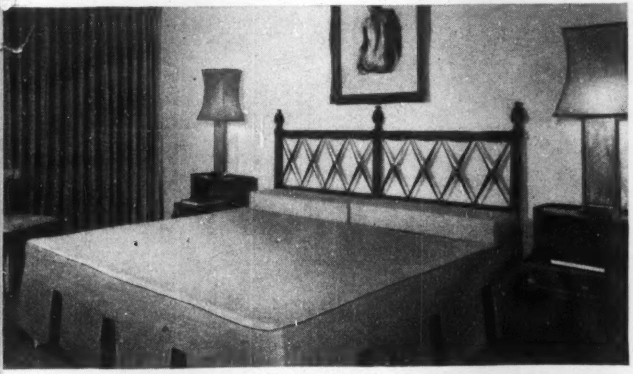
Comfort going up. Uncompleted exterior of new 1000 Lake Shore Drive Apartments in Chicago. Harold L. Perlman, Sponsor; Sidney H. Morris & Associates, Architects and Engineers; William Goodman, Mechanical Engineer; Plonsker Engineering Company, Heating Contractors.




BEDROOM 1
LIVING-DINING
BEDROOM
LIVING
BEDROOM 2
K
DINING
GOLD COAST FOYER
BEDROOM 2
BEDROOM 1
LIVING-DINING
BEDROOM
LIVING-DINING
BEDROOM 1
BEDROOM 2
LIVING
BEDROOM
HALL
LAKE SHORE FOYER
LIVING-DINING
BEDROOM 3
BEDROOM
BEDROOM 1
BEDROOM 2
LIVING
DINING
THERMOSTAT

TYPICAL FLOOR PLAN

Living area comfort. Comfort in the living areas is controlled by an individual thermostat in each apartment, as the floor plan shows. Tenants select the temperature *they* like, don't have to put up with an unsatisfactory average building temperature that satisfies practically nobody.



Sleeping area comfort. In the larger apartments, having two exposures (see floor plan) there's a *second* thermostat in the sleeping area. This enables tenants to maintain a second, cooler temperature in the bedrooms for more healthful sleeping. And with one or two thermostats in each apartment, tenants on the north are just as comfortable as those on the south—no matter how bitter the winter winds.

MINNEAPOLIS
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First in Controls

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For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

Harold L. Perlman, sponsor of 1000 Lake Shore Drive Apartments, says:

"We expect our new building to be one of the finest, most comfortable places to live in Chicago. Certainly Honeywell Customized Temperature Control will contribute importantly to that."

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I'm interested in learning more about Honeywell Customized Temperature Control. For a new building ☐ For an existing building ☐

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Firm Name ....

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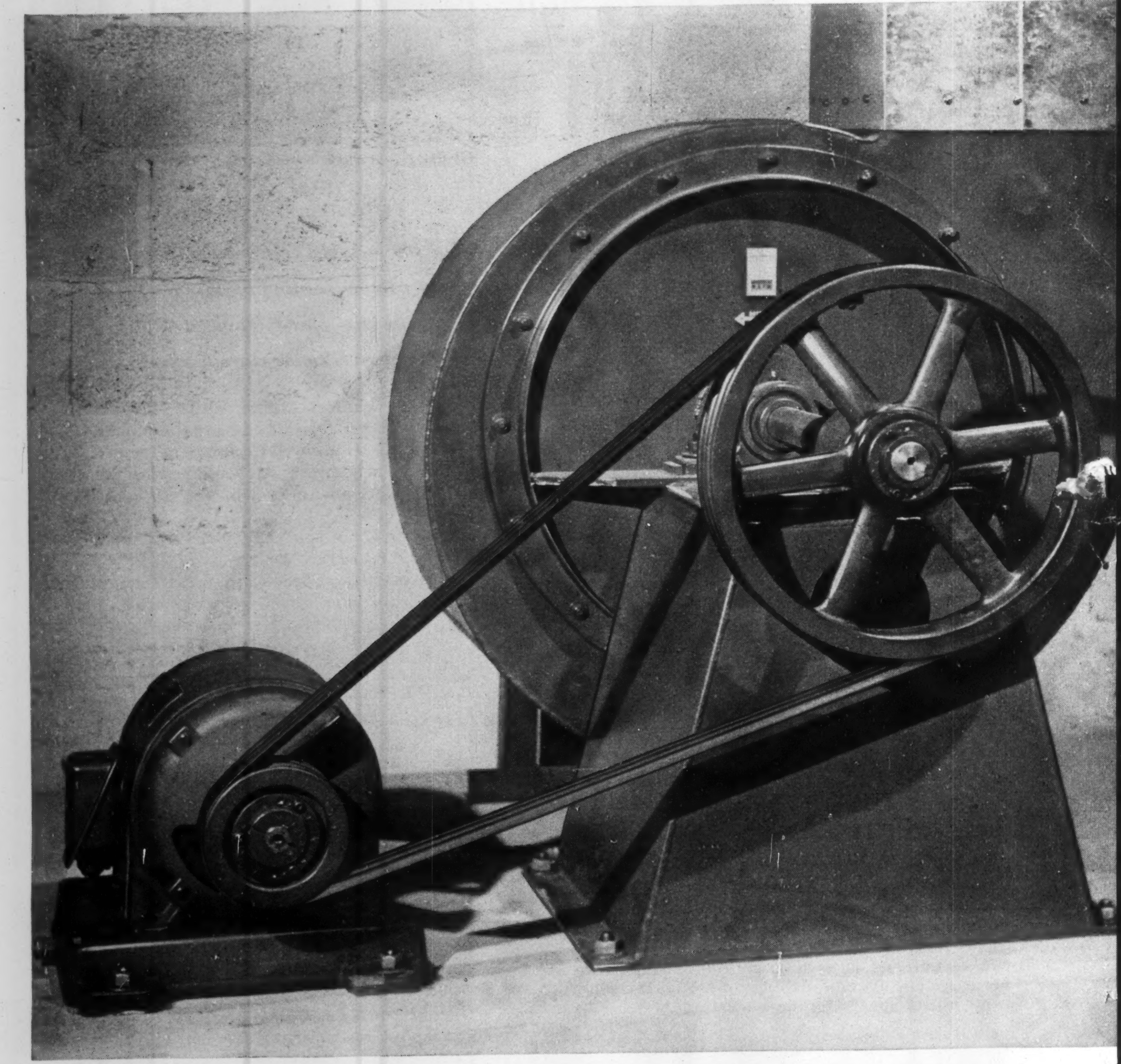
Complete

With 3 Extra



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Put the Allis-Chalmers control-motor-drive combination on your air conditioning job and you'll benefit three ways:

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A-4208

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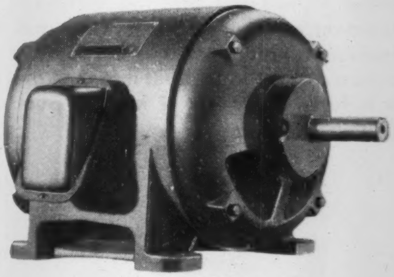
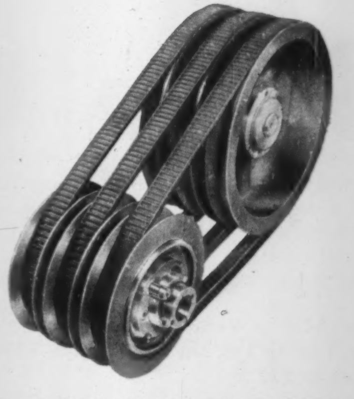


MOTOR



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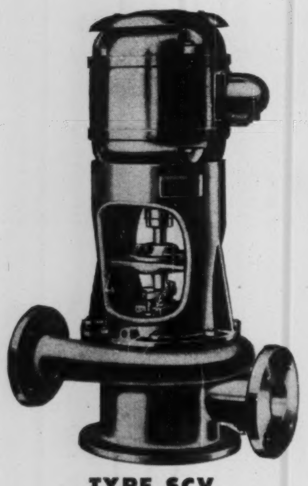
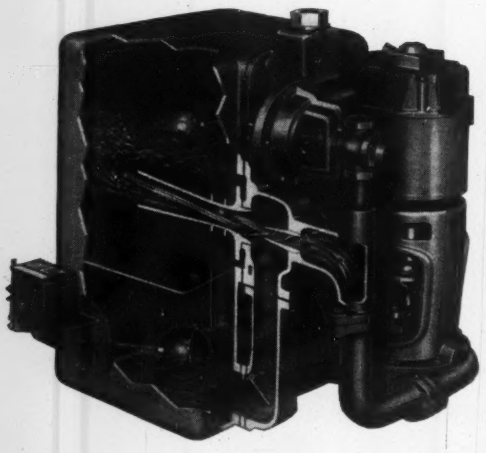


TYPE SCV

TYPE VV



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WHEELER-ECONOMY HOT WATER CIRCULATING PUMPS

Type SCV — Vertical direct connected centrifugal. Sizes 1 in. to 3 in. Up to 500 gpm. 1150 to 3450 rpm. Heads to 225 ft.

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HEATING PUMPS

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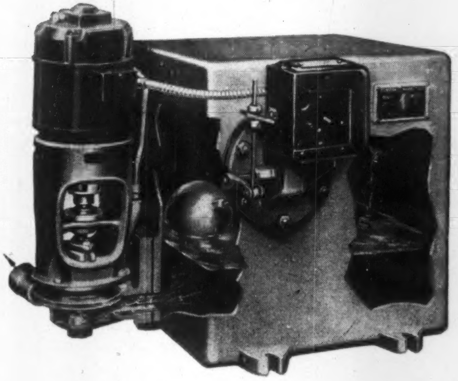

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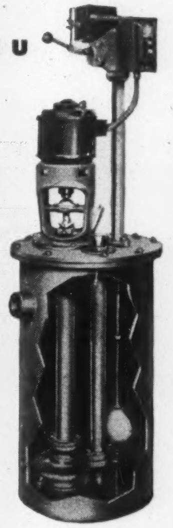

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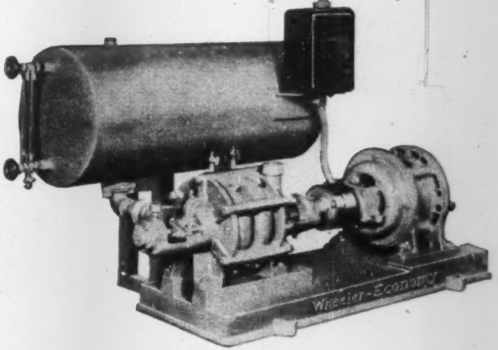


WHEELER-ECONOMY RETURN CONDENSATION PUMPS

Type E — 1750 rpm. (1450 rpm at 50 cycle current). Flexible coupled. Quiet operation. Single and duplex units. Direct C.I. radiation or equivalent: 1000 to 65,000 sq. ft.

Type EC — For same or higher pressure than Type E. 3450 rpm. (2880 rpm for 50 cycle current). Direct C.I. radiation or equivalent 1000 to 65,000 sq. ft. Single and duplex units.

Type C — Multi-stage for pressures to 175 lbs. 3600 rpm 60 cycle. Identical to Type B except for higher speed operation.

Type G — Horizontal Return Condensation Pump — Single suction, single stage for medium and high pressures. 1800 to 3450 rpm.

Type U — Vertical Underground. For returns below floor level, etc. No pit required for pump. Low and medium pressure units equipped with single stage pumps of vertical design. For higher pressure units a multi-stage pump of special design is used. Direct C.I. radiation or equivalent 2000 to 50,000 sq. ft. Single and duplex units.

Type MR — Close-coupled, low cost Pump for low pressure steam heating systems. Capacities to 65,000 sq. ft. EDR. Single and Duplex Units.

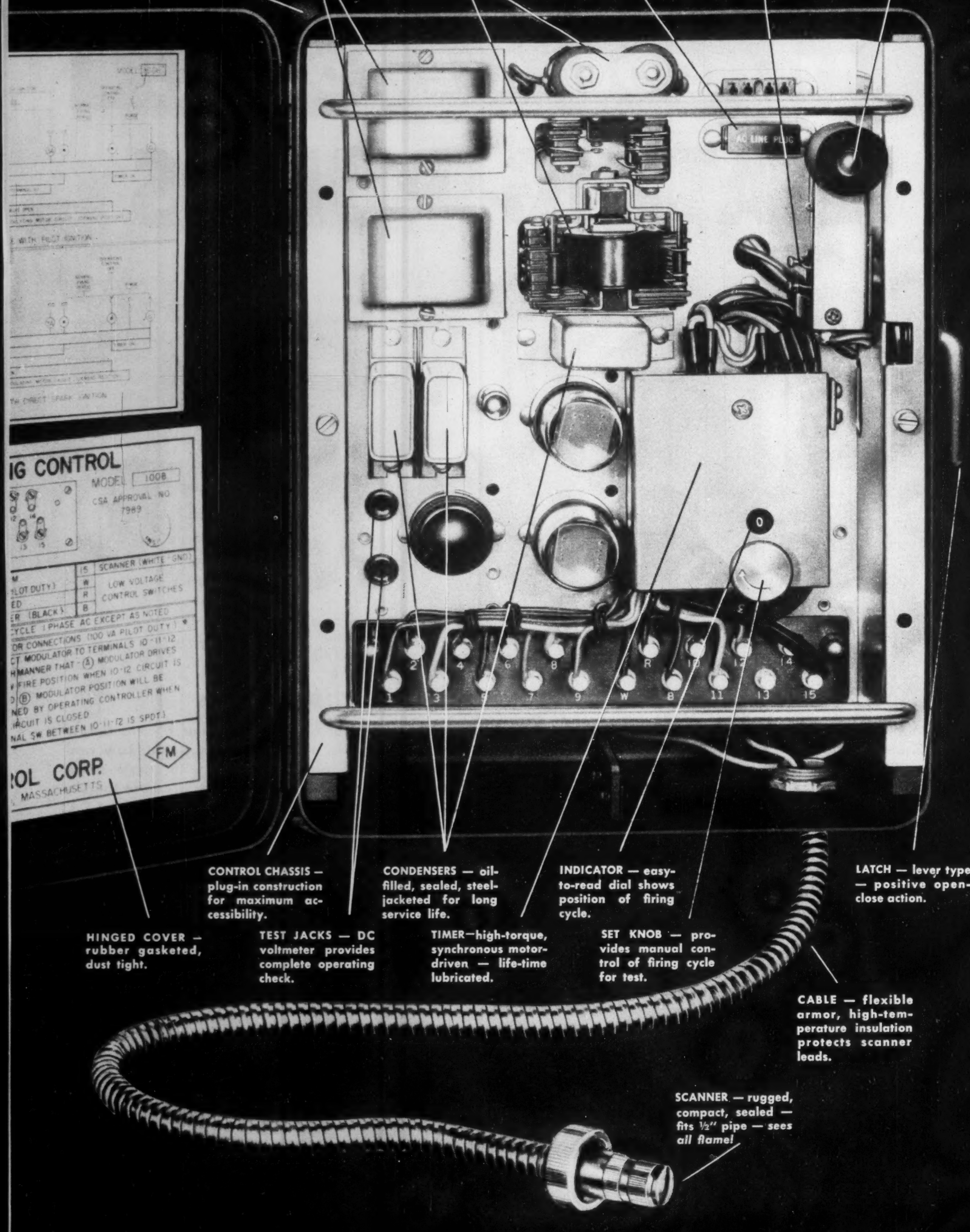
Type B — Horizontal Return Condensation Pump — multi-stage type for pressures to 150 lbs. 1750 rpm. Quiet operation. Direct C.I. radiation or equivalent, 6000 to 65,000 sq. ft.

WE-405

C. H. WHEELER *of Philadelphia*

C. H. WHEELER MANUFACTURING CO., 19th & LEHIGH, PHILADELPHIA 32, PENNA.

Steam Condensers • Centrifugal, Axial and Mixed Flow Pumps • Steam Jet Ejectors • Vacuum Refrigeration
High Vacuum Process Equipment • Micro-Particle Reduction Mills • Marine Condensers and Ejectors • Deck Machinery


IG CONTROL
MODEL 1008
CSA APPROVAL NO 7989
SCANNER (WHITE GND)
LOW VOLTAGE CONTROL SWITCHES
ROL CORP.
MASSACHUSETTS
FM
AC LINE PLUG
1
2
3
4
5
6
7
8
9
W
R
B
10
11
12
13
14
15

HOUSING — heavy-gauge, deep-drawn steel for rugged, industrial use.

TRANSFORMERS — heavy duty — moisture resistant coils.

RELAYS — moisture proof coils — oversize electrolytic fine silver contacts — heavy pressures.

LINE PLUG — instantly adapts control for 115 or 230 volts AC.

SAFETY LOCKOUT SWITCH — temperature compensated for positive action.

RESET BUTTON — for startup after flame failure.

CONTROL CHASSIS — plug-in construction for maximum accessibility.

CONDENSERS — oil-filled, sealed, steel-jacketed for long service life.

INDICATOR — easy-to-read dial shows position of firing cycle.

LATCH — lever type — positive open-close action.

HINGED COVER — rubber gasketed, dust tight.

TEST JACKS — DC voltmeter provides complete operating check.

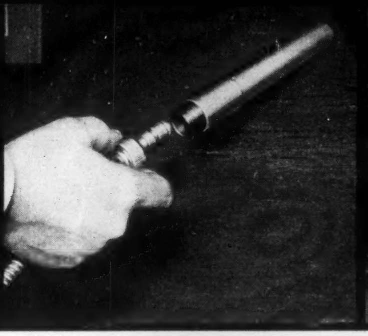
TIMER—high-torque, synchronous motor-driven — life-time lubricated.

SET KNOB — provides manual control of firing cycle for test.

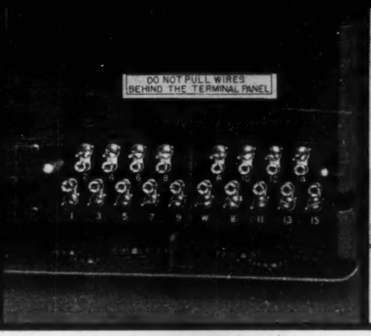
CABLE — flexible armor, high-temperature insulation protects scanner leads.

SCANNER — rugged, compact, sealed — fits ½" pipe — sees *all flame!*

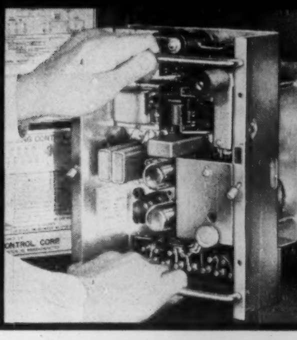
Unique flame-sensitive Cell — sealed, lifetime construction — never wears out. Sees through dirt, soot, smoke.



Amazingly compact Scanner cuts installation costs — screws on end of ½" pipe. Single scanner detects both pilot and main flames.



Readily accessible Terminal Panel — clearly marked terminals for easy wiring — ample trough space. Allows for extra operating controls and alarms.



Plug-In Chassis removes in seconds without disturbing wiring — simplifies installation, maintenance, replacement. Husky guide pins, self-aligning sockets insure reliable contact.

Why fireye is the standard...

for flame failure protection and automatic programming of industrial oil burners.

9 out of 10 new package burners are Fireye FP-2 equipped. Ruggedness and performance features brought about this overwhelming acceptance . . . and they'll make a hit with you too!

Proved in 50,000 installations, the FP-2 Control provides safe programming for any burner application — is easy to install and service — gives long-time dependability with minimum maintenance. Components are of superior industrial quality — withstand moisture, vibration, high temperature — give continuous peak performance.

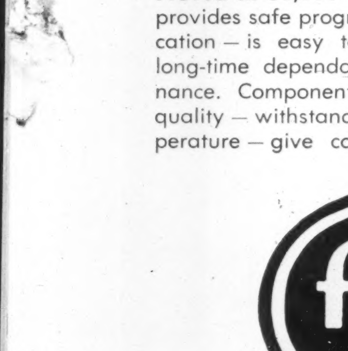
Every unit is cycle-tested equivalent to one month's operation before leaving the factory.

A single, compact scanner provides positive flame failure protection through electronic supervision of both pilot and main flames. Never wears out. Can be used with combination oil/gas burners too, because it *sees all flame!*

From every angle, Fireye FP-2 is designed and built to save you time and trouble. Write today for full information. Combustion Control Division, Electronics Corporation of America, Dept. C13-10, 718 Beacon St., Boston, Mass.

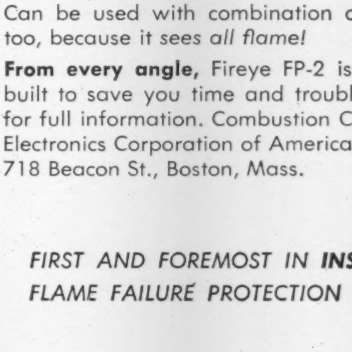
fireye ®

*FIRST AND FOREMOST IN **INSTANT** FLAME FAILURE PROTECTION*

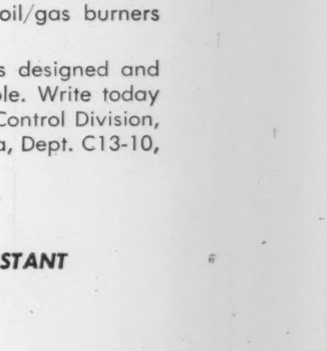


Precision assembled Timer — snap-action cam contacts — straight phospher bronze leaves that never need adjustment. Easy-to-read dial indicates programming sequence.

Laminated core Master Relay has vacuum impregnated coil, electrolytic fine silver contacts with extra-heavy contact pressures. Built to outlast the burner installation.



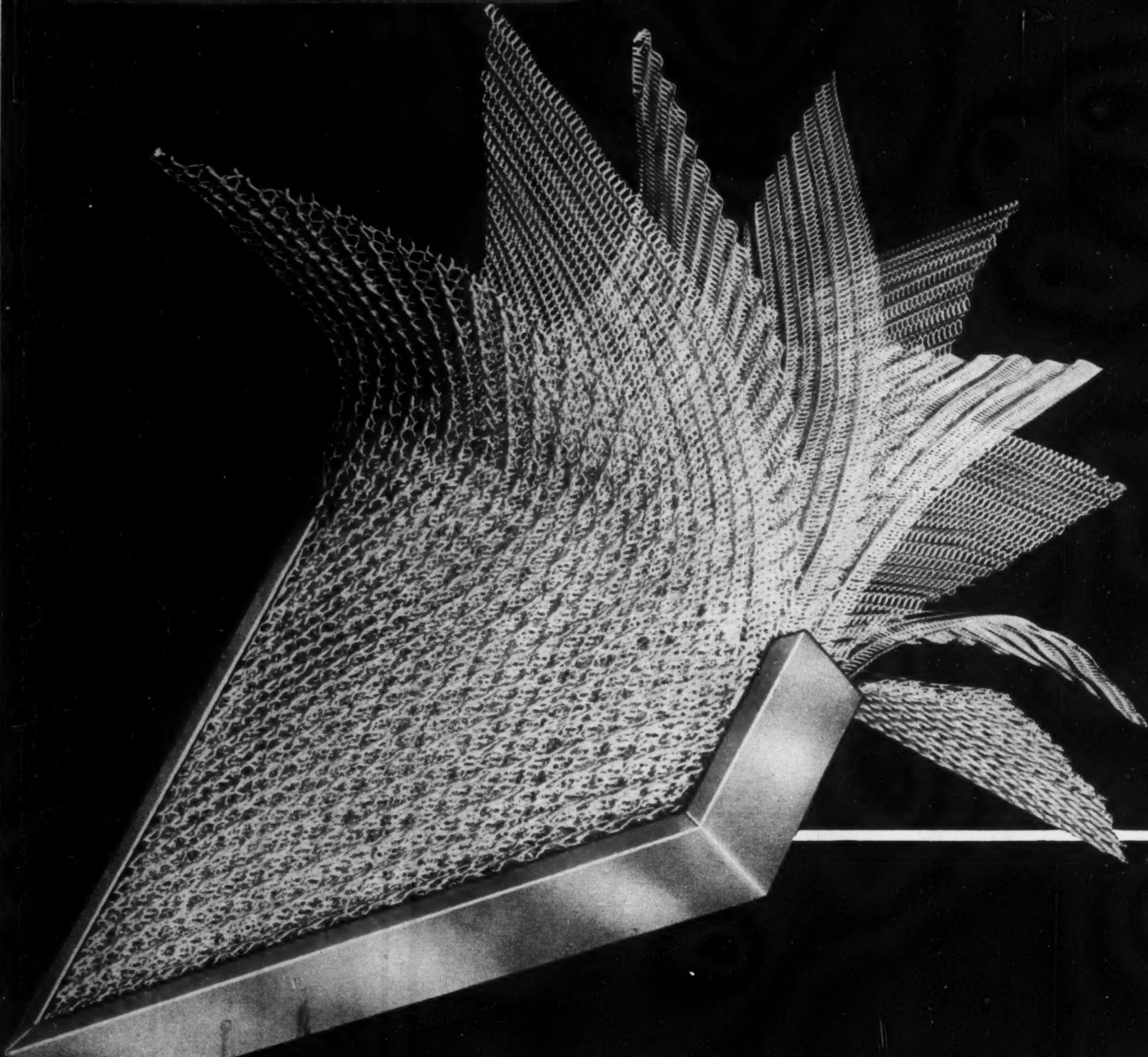
Convenient Test Jacks permit use of inexpensive DC voltmeter for complete system check without interrupting operation.



Factory Mutual and Underwriters' Laboratories approval attest to excellence of design and ruggedness. Accepted by all industrial insurance organizations and the U.S. Navy.

WE DARE TO DISCUSS **LINT** *

Evans *Lifelong*



. . . THE MOST AVOIDED WORD IN AIR FILTERING

AIR FILTERS

*SPECIAL FILTERING ACTION CATCHES AND HOLDS LINT WITHOUT STOPPING AIR FLOW

Make no mistake about it . . . the above statement is not just a claim . . . IT IS AN ABSOLUTE PROVEN FACT. Proven with a test dust that contained *6 times as much lint as that generally accepted for filter testing.*

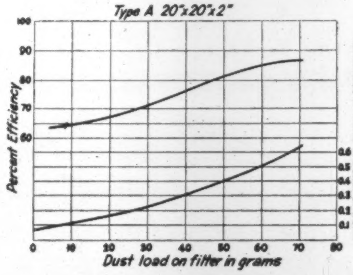
HERE IS THE COMPARISON

GENERALLY ACCEPTED TEST DUST		EVANS TEST* DUST	
72%	standardized air cleaner test dust, fine, (Arizona Road Dust, fine)	61%	standardized air cleaner test dust, fine (Arizona Road Dust, fine)
25%	K-1 Carbon Black	21%	K-1 Carbon Black
3%	No. 7 Cotton Linters (percentages by weight)	18%	COTTON LINTERS . . . THESE LINTERS RANGING IN LENGTH FROM 1/8", 1/4", 3/8" and 1/2" WERE ADDED IN EQUAL PORTIONS TO GIVE AN ADDITIONAL 15% LINT TO THE FORMULA.

THIS NEW EVANS FORMULA WAS USED TO PROVIDE A TEST DUST WHICH WOULD BE MORE REALISTIC IN MATCHING EVERY DAY WORKING CONDITONS.

In addition to using dust with an 18% lint content Evans . . . in order to establish the most grueling possible conditions . . . employed a *continuous feeding process.*

The full amounts of dust were fed into the filter over a period of 2, 3 or 4 hours. (This process was continuous except for a 5 to 10 minute break at the end of each hour which was required to reload dust and fiber feeders.)



THESE EXCLUSIVE EVANS FEATURES MADE THIS PHENOMENAL FILTERING PERFORMANCE POSSIBLE

- **PRECISION ANGLED OPENINGS FORCE AIR INTO EXTREMELY HIGH TURBULENCE. CAUSE IT TO TRAVEL 3.5 TIMES DEPTH OF FILTER FROM INLET TO OUTLET SIDE.**
- **ROUGH, TALONLIKE BURRED EDGES GRIP AND HOLD DIRT AND LINT. FORCE AIR TO TRAVEL OVER 1.24 MILES OF THESE EDGES IN A 20" x 20" x 2" SIZE FILTER.**
- **NO THICK AND THIN SPOTS. AIR IS PULLED INTO FILTER EQUALLY OVER ENTIRE FILTER PACK SURFACE.**
- **RIGIDITY OF FILTER PACK ELIMINATES ALL FLUTTER.**
- **LARGE PRECISION CUT OPENINGS ON INLET SIDE HOLD MANY TIMES MORE LINT WITHOUT STOPPING AIR FLOW. UTILIZE FILTER DEPTH.**

AMAZING NEW MERCHANDISING POLICY PROTECTS DISTRIBUTORS, JOBBERS, AND DEALERS

Guarantees this protection. Opens an amazing new field in sales and profits.

If you are now handling an old-fashioned line of filters, which is not giving adequate filtering performance, adequate profits, adequate customer satisfaction and adequate territory protection, then get complete Evans story on both the new lifelong filter and the new merchandising policy.

INVESTIGATE NOW! MAIL THIS COUPON TODAY!

THE GEORGE EVANS CORPORATION, MOLINE, ILLINOIS

GENTLEMEN: Please send me: ☐ Descriptive Literature ☐ Merchandising Policy ☐ Price Lists

I WANT TO LEARN HOW TO MAKE MORE MONEY OUT OF THE FILTER BUSINESS.

NAME .... COMPANY ....

ADDRESS ....

CITY .... STATE ....

THE Aerofuse LINE

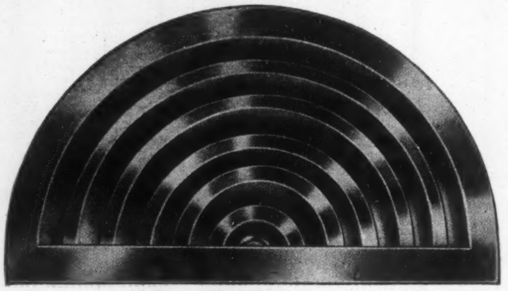
In appearance, Aerofuse Diffusers are styled to harmonize with contemporary architectural concepts . . . in performance, the flexibility of the line permits engineers to select a type and size that will operate with top efficiency . . . simplicity of design and rugged construction result in simplified installation. Good reasons why Aerofuse Diffusers have nation-wide acceptance by architects, engineers, contractors and owners, and are installed in the most modern multi-story office buildings and department stores, in commercial and recreational buildings, institutions and industrial plants . . . wherever people work or relax in air conditioned comfort.

TYPE PA
Adjustable pattern diffuser

TYPE PR
Flush type, fixed pattern supply and return diffuser

TYPE PLF
Flush type, fixed pattern diffuser combined with light fixture

TYPE S
Flush type, fixed pattern diffuser



TYPE H
Flush type, fixed pattern half-round diffuser

Accessory Equipment

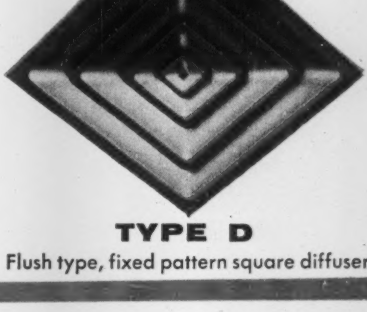
To meet specific air delivery requirements, volume control dampers, distributing grids, blanking baffles, and other accessory equipment is available for all Aerofuse Diffusers.

A wide selection of diffuser types and sizes, styled and engineered to meet the most rigid requirements of appearance and performance at the point of air delivery

TYPE PS
Stepped-down type, fixed pattern diffuser

TYPE PF
Flush type, fixed pattern diffuser

TYPE PH
Flush type, fixed pattern, half round diffuser



TYPE D
Flush type, fixed pattern square diffuser

TYPE ES
Stepped-down type, fixed pattern diffuser

TUTTLE & BAILEY inc
T & B
NEW BRITAIN, CONNECTICUT

NEW . . . Aerofuse Catalog No. 108.

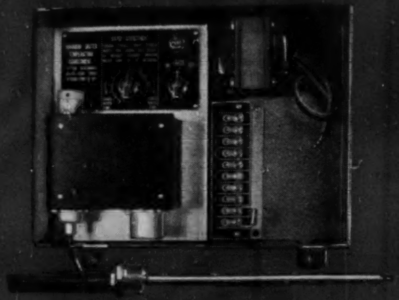
Complete information on the Aerofuse line of ceiling diffusers and accessory equipment, engineering data, size selection charts and directions for installation. Send for your copy today.

BARBER COLMAN

REMOTE BULB AND ELECTRONIC

Hot Water Controls

Complete range of outdoor reset control systems available for any building...residence to skyscraper!

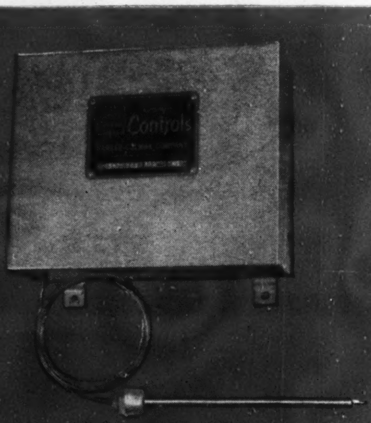


ADJUSTABLE RATIO TWO-POSITION CONTROL

Adjustable ratio, outdoor reset, two-position control provides on-off operation of burner to vary supply water temperature in accordance with outdoor temperature. Control components housed in cabinet, ready to install.

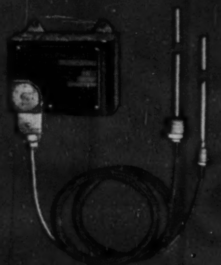
OUTDOOR ADJUSTER

Used with either two-position or proportioning adjustable ratio bulb controls for resetting control point in proportion to changes in outdoor temperature. Optional pump cutoff switch.

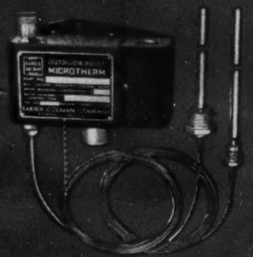


ADJUSTABLE RATIO PROPORTIONING CONTROL

Positions a Barber-Colman proportioning motor-operated valve to vary supply water temperature in accordance with outdoor temperature. Metal cabinet.



DUAL BULB THERMOSTAT One bulb installs in boiler water, other outdoors. Eliminates excessive over-and undershooting.



DUAL BULB PROPORTIONING THERMOSTAT Control point varies with outdoor temperature. Positions proportioning motor-operated valve.

New variety! New flexibility! New adjustability! Overcome "lag"

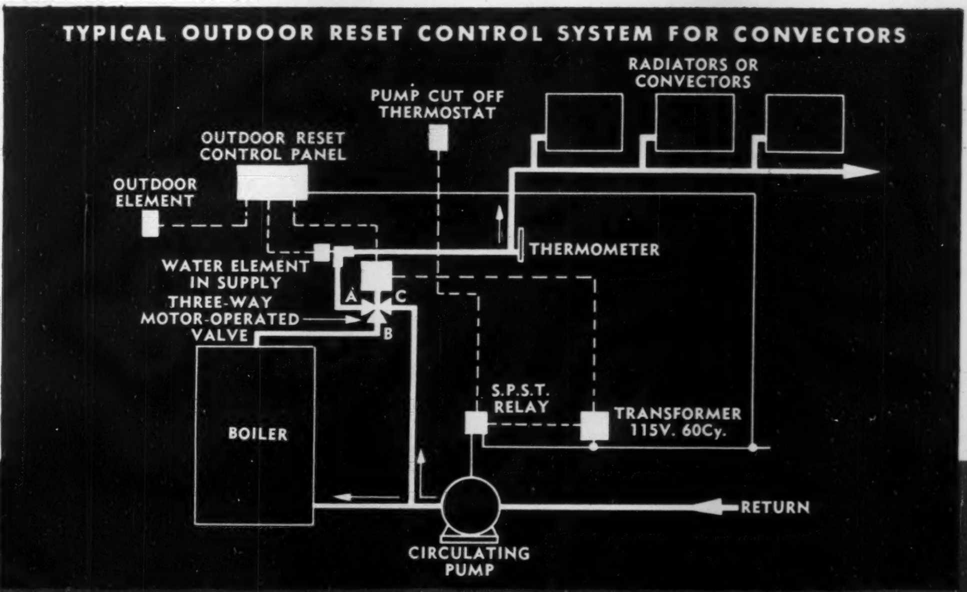
Wonderful comfort for occupants of *any* building is possible today with Barber-Colman's versatile, flexible, economical, outdoor reset, hot water controls. You maintain a continuous, even flow of heat regardless of weather changes. You prevent over-and undershooting. You can specify night depression with morning warm-up. From advanced Barber-Colman developments, you can select dual bulb, adjustable ratio remote bulb, electronic, or any combination of types to meet job requirements in the best possible way.

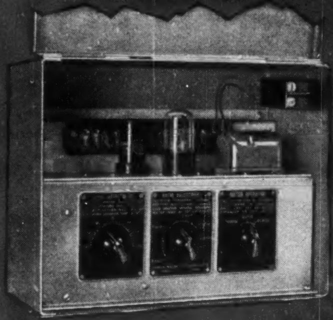
Automatic Controls
outdoor reset
BARBER COLMAN
Hot Water Controls
Two-position and proportioning outdoor reset controls for hot water heating systems...

NEW DATA BULLETINS NOW READY

Mail request, or phone nearby Field Office for complete kit of up-to-the-minute literature on latest developments in automatic hot water heating control.

TYPICAL OUTDOOR RESET CONTROL SYSTEM FOR CONVECTORS


RADIATORS OR CONVECTORS
PUMP CUT OFF THERMOSTAT
OUTDOOR RESET CONTROL PANEL
OUTDOOR ELEMENT
THERMOMETER
WATER ELEMENT IN SUPPLY
THREE-WAY MOTOR-OPERATED VALVE
A
C
B
BOILER
S.P.S.T. RELAY
TRANSFORMER 115V. 60Cy.
RETURN
CIRCULATING PUMP



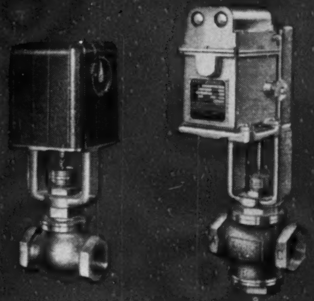
ADJUSTABLE RATIO ELECTRONIC CONTROL PANEL

Fully proportioning electronic panel positions electric motor-operated valve to vary supply water temperature in accordance with outdoor temperature. Extremely sensitive. Here is the finest electronic hot water control on the market. All adjustments on legible, easily understood dials. Easy to install and operate.

BARBER COLMAN
ELECTRONIC
Controls
BARBER-COLMAN COMPANY

ADJUSTABLE RATIO TWO-POSITION ELECTRONIC PANEL

Provides on-off operation of burner to vary boiler water temperature in accordance with outdoor temperature. Sensitive, flexible—the ultimate in modern design.



MOTOR-OPERATED VALVES

Available in wide range of sizes and types—two-position for zone control—proportioning single-seat type for converter steam supply—proportioning three-way for controlling boiler water supply.

IMMERSION ELEMENT

OUTDOOR ELEMENT

NIGHT DEPRESSION WITH MORNING WARM-UP

DEPRESSION
MIN
MAX

Adjustment dial in panel

Electric time switch

NEW "PRIMER" ON ELECTRONIC CONTROLS

The Electronic CONTROL STORY

Removes mystery from electronic controls. Explains fundamentals. Illustrates applications. Complimentary copies now available for architects, engineers, contractors.

BARBER COLMAN

REMOTE BULB AND ELECTRONIC

Hot Water Controls

BARBER-COLMAN COMPANY, ROCKFORD, ILLINOIS

Automatic Controls • Air Distribution Products • Industrial Instruments Aircraft Controls • Small Motors • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

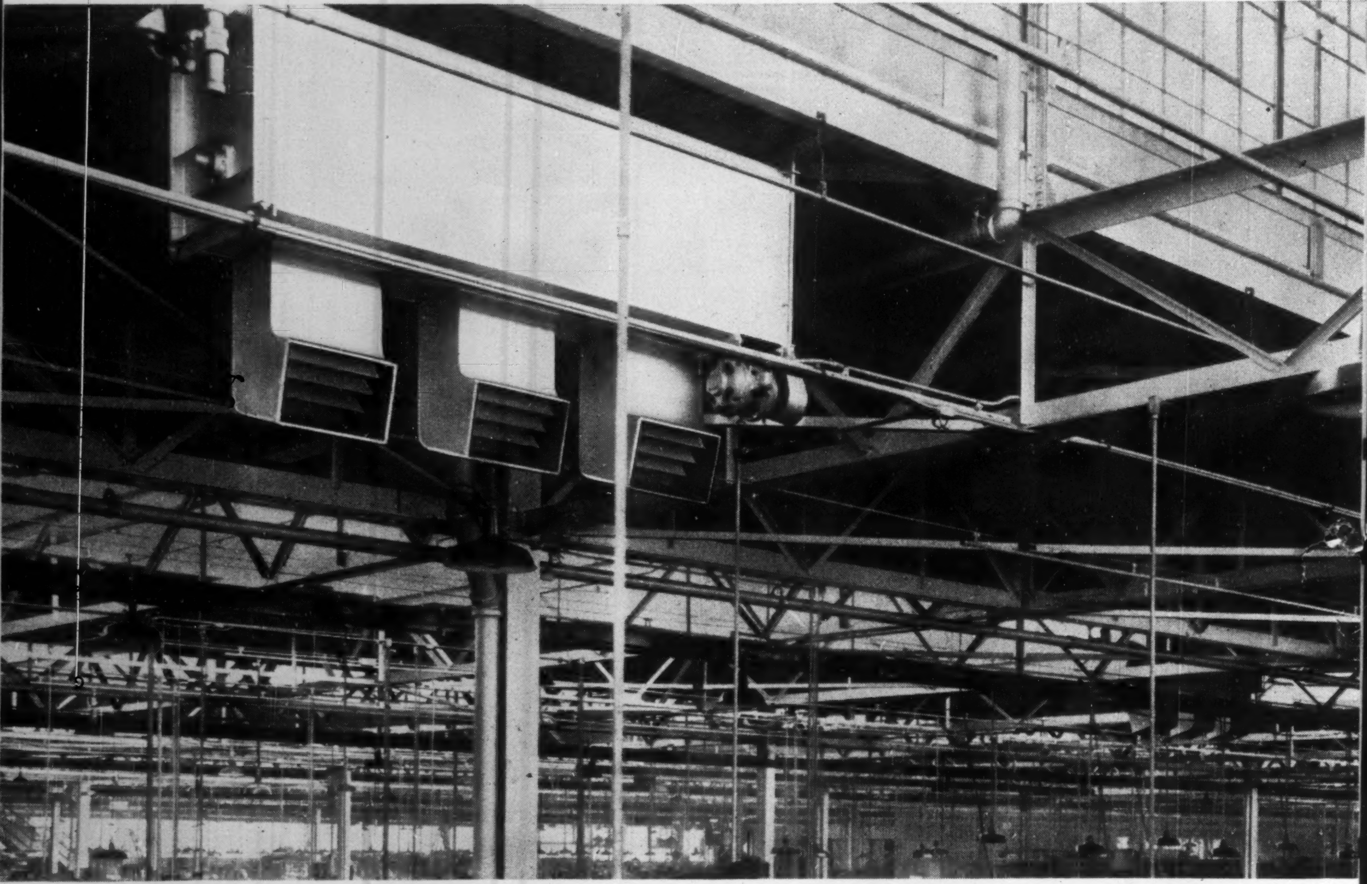
BARBER-COLMAN COMPANY
Dept. J, 1301 Rock St., ROCKFORD, ILL., U.S.A.
Field offices in principal cities

☐ Send free kit on modern hot water control systems
☐ Send free copy "The Electronic Control Story"

Name________________________
Firm Name________________________
Address________________________
City________________ State________

Here's why Trane Unit Heaters are in such demand:

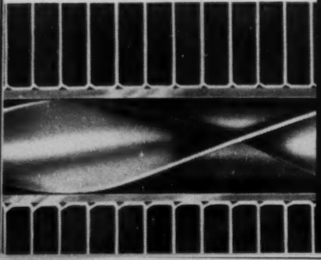
One unit can solve plant air cleaning or



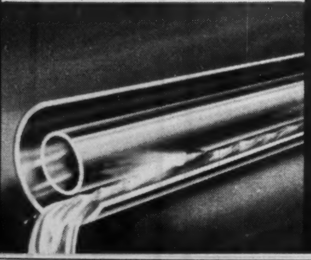
What the Torridor will do: The Torridor can be used to heat large areas where air must be spread over great distances, is equally suitable for heating numerous small rooms or a central system with ducts. It can be used as a combined heating and ventilating unit . . . for blanketing doorways with heat . . . for special process applications such as fog removal, ice melting, drying, curing, etc.

Typical users include: Pratt and Whitney Aircraft; Western Electric Co.; Carbide and Carbon Chemicals Co.; Caterpillar Tractor Co.; Deere and Co.; Johns-Manville Corp.; Kimberly-Clark Corp.; Corning Glass Works; International Business Machines Corp.

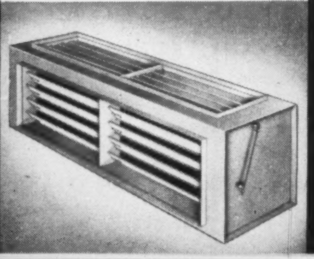
Turbulator in hot water coils assures maximum heat transfer from hot water to surface of coil tubes.



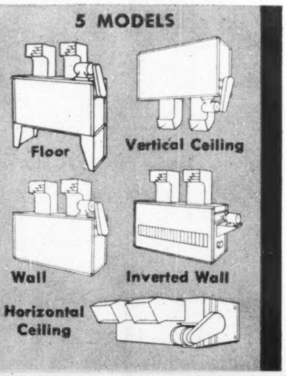
Kinetic orifice in steam coils releases steam in direction of condensate flow, speeds condensate drainage. Reduces possibility of freeze-up.



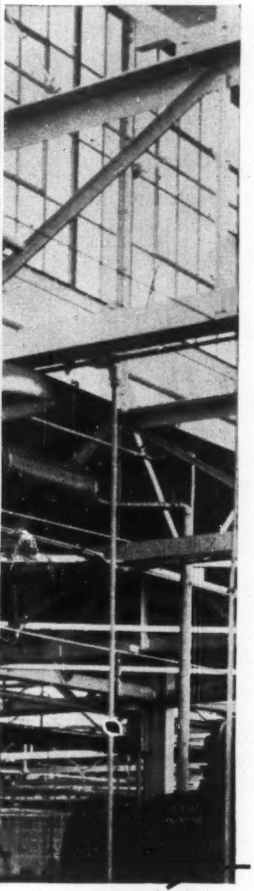
Mixing box blends re-circulated with outside air in any combination. Dampers may be operated manually or motorized. A standard accessory.



5 MODELS



heating, ventilating, process-drying needs

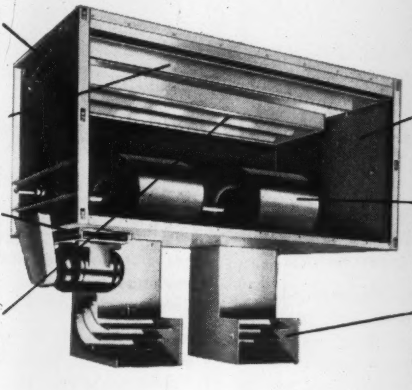


Use this Trane Torridor with or without ducts...in large areas or small...for comfort or process heating and ventilating needs.

One unit does the work of many! A single Trane Torridor unit can produce as much heat as several propeller-type heaters—plus ventilation. Pipe, valve and fitting needs are less . . . installation and maintenance costs are lower. Capacities up to 1½ *million* Btu's.

Locate Torridors anywhere! Units can be hung from walls or girders, mounted on ceilings, or set on the floor. A wide choice of nozzle arrangements, top or bottom discharge lets you direct warmth in any desired direction.

For hundreds of applications. Heating, ventilating, air cleaning, process heating or drying . . . the amazingly versatile, high-capacity Trane Torridor solves many of these problems. For complete information contact your engineer or nearest Trane Sales Office, or write Trane, La Crosse, Wisconsin.



Rugged casing of bonderized steel. Extra strong, rigid, *welded* construction.

Coil choice of high or low pressure steam, hot water, standard or "nonfreeze" SD type.

Hinged motor mounting block for quick, easy adjustment of belt tension.

Damper choice in ventilating models. Face-and-bypass (shown) or Thermadjust.

Filter choice of permanent or throwaway types, in flat or V-type frames.

Removable panel provides easy access to heart of unit. (Shown removed.)

Quiet fans dynamically and statically balanced on electronic equipment.

Directional vanes in the nozzles straighten air stream, eliminate turbulence.

one source • one responsibility

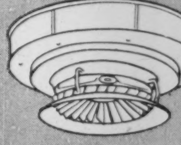
TRANE

Industrial Heating

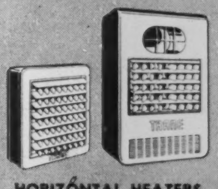
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 15 Canadian Offices

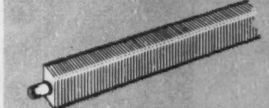
Quality products for all your heating and ventilating needs



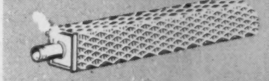
PROJECTION HEATER



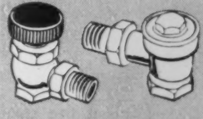
HORIZONTAL HEATERS
Model H—Gas-Fired



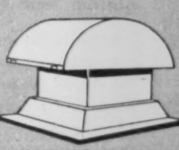
WALL FIN ELEMENT



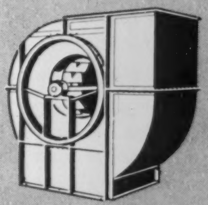
WALL FIN WITH GRILLE



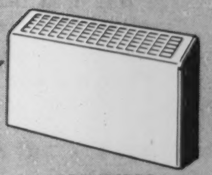
STEAM SPECIALTIES



ROOF VENTILATOR



CENTRIFUGAL FAN



CONVECTOR

"Looks like everything you said, Jim"

"This is the spot I was telling you about, Ken. Good cover, good feed, lots of birds, not many hunters. Bill Brown and I got our limits here the other day. Boy, is he a terrific shot!"

"He was telling me about it too, Jim, and it sure looks like everything you said. Bill stopped in yesterday with prints on those aluminum extrusions Wolverine is making for us. Their Tubemanship is even better than Bill's marksmanship. I was certainly impressed with those prints. Did you ever see that Alabama plant of theirs—in Decatur?"

"No, but I've seen the pictures Bill has."

"They don't do it justice. When you see it for yourself you realize why it's called 'the world's most modern tube mill'."

"It's close to your southern branch, isn't it?"

"Less than 200 miles away. We do a lot of business with Bill. Not only in aluminum tube and shapes but in copper and copper-base alloy as well. For us dealing with Wolverine is like having two sources."

"Two sources. How do you mean?"

"Well, their Detroit plant is also one of the finest and we often order our welded steel tube there for our eastern plant."

"Say, that must save a lot of 'shopping around'."

"It does and in more ways than one. We like the completeness of Wolverine's facilities. We use a lot of tubing and they can meet our requirements. Sometimes we order plain tube; sometimes it's finned. Quite often we use their fabricated tubular parts."

"You know, Ken, Bill would get a real kick out of this. Here we are on his favorite hunting grounds talking about his favorite subjects—Wolverine and hunting."

"Terrific, isn't it. Let's be sure to tell him. Just in case he asks we better have some of those ring-neck pheasants to tell him about, too."

• • •

SURE AS SHOOTING: You can count on Wolverine Tube for the finest in copper, steel and aluminum tubing and extruded aluminum shapes. Write—right now—for your copy of the Wolverine Flow Chart. WOLVERINE TUBE, Division of Calumet & Hecla, Inc., 1461 Central Avenue, Detroit 9, Michigan.

EST. 1916

WOLVERINE TUBE

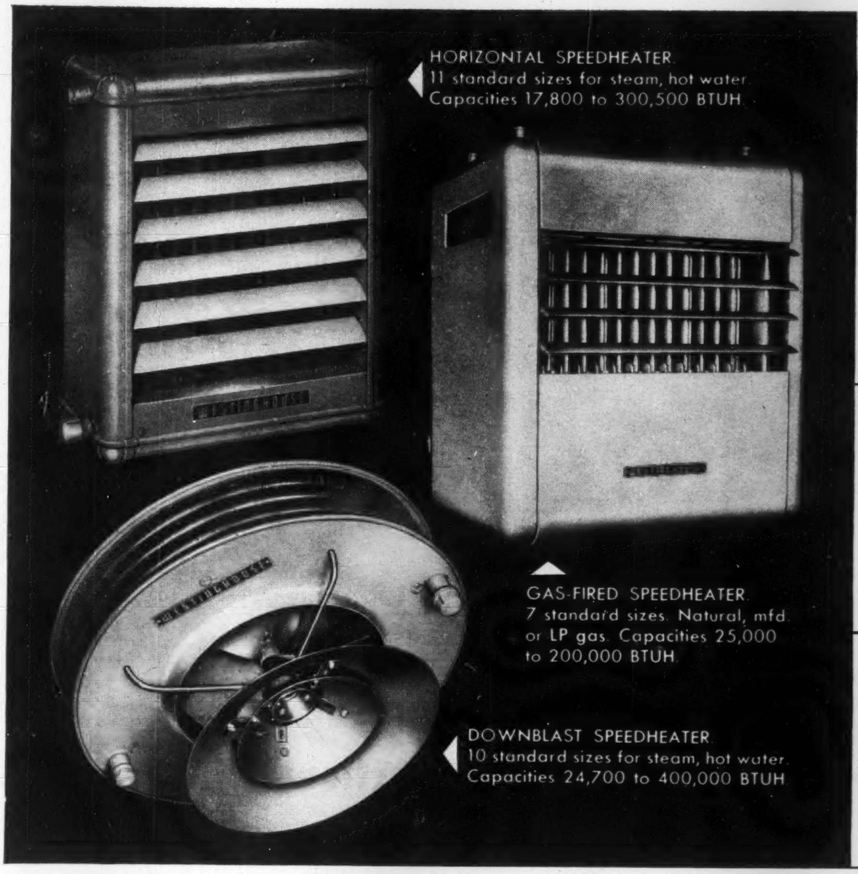
DIVISION OF CALUMET & HECLA, INC.

Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

Wolverine Trufin available in Canada through the Unifin Tube Co., London, Ontario

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPARTMENT, 13 EAST 40TH STREET, NEW YORK 16, N. Y.



HORIZONTAL SPEEDHEATER.
11 standard sizes for steam, hot water.
Capacities 17,800 to 300,500 BTUH.

GAS-FIRED SPEEDHEATER.
7 standard sizes. Natural, mfd. or LP gas. Capacities 25,000 to 200,000 BTUH.

DOWNBLAST SPEEDHEATER.
10 standard sizes for steam, hot water.
Capacities 24,700 to 400,000 BTUH.

CHECK THESE WESTINGHOUSE HORIZONTAL SPEEDHEATER SPECIALS!

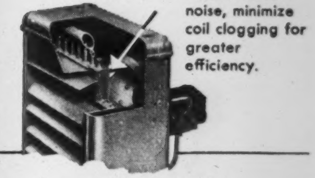
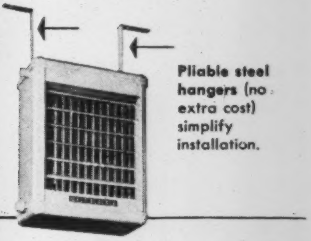
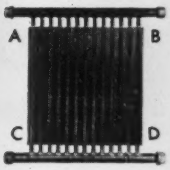


Plate fins cut noise, minimize coil clogging for greater efficiency.



Pliable steel hangers (no extra cost) simplify installation.



Four connection combinations (A-C, B-D, A-D, B-C) allow tight-spot installation.

The traditional value in unit heaters—

Westinghouse Speedheaters®

for instant heat... quiet heat... low-cost heat

Built for strength, built for style, built to install easily and satisfy for years.

For today's outstanding heating value, look to a pioneer name in unit heaters—look to Westinghouse Speedheaters! Check, before you specify, all the features that add up to traditional Speedheater superiority:

(1) **instant heat**—generated at the flip of a switch, and all of it effective heat because the Speedheater one-row, plate-fin heating element assures most efficient heat flow;

(2) **quiet heat**—the Speedheater, always known for silent operation, is quieter than ever! Aluminum plate fins, mechanically bonded, cut noise . . . rugged, welded construction eliminates rattles . . . powerful die-formed fans send heat where it's needed, do it *quietly;*

(3) **low-cost heat**—heat that saves dollars on fuel (up to 25% savings in present installations over old-style systems), more dollars in pure-and-simple efficiency in heating spots or large zones, in supplementing central systems in any required pattern.

Check other Speedheater values, too: the pliable steel hanger straps and flexible connection combinations (see cuts) that simplify Horizontal model installation . . . the multiple-cone diffusers on Downblast model that give positive heat control, especially desirable for buildings with high ceilings . . . the all-purpose AGA-approved Gas-Fired model that eliminates the need for central system heating. For full information call your Westinghouse-Sturtevant heating specialist now. Or write: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

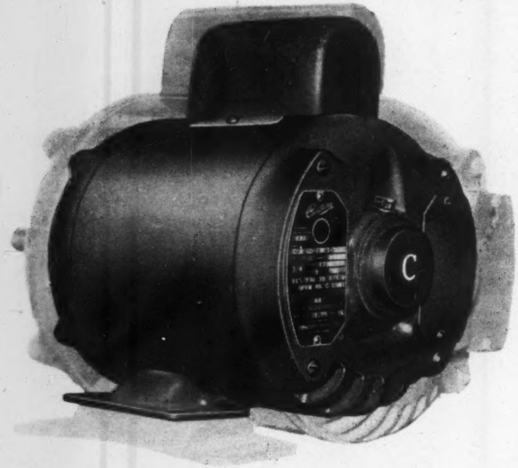
WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80421

MORE POWER IN SMALLER FRAMES

SAVE SPACE

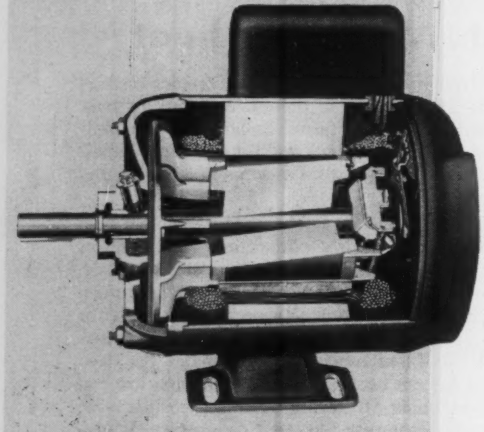


WEIGH LESS

NEW Century Form "F" Fractional H.P. Motors

NOW AVAILABLE IN ⅛ TO ¾ H.P.

Thanks to new techniques developed in the last several years, this *smaller* power package combines improved performance with even greater Century dependability.



Here's What New Techniques Deliver...

1. Better magnetic characteristics for the motor because of more uniform silicon laminated steel in magnetic cores.
2. A high dielectric and increased abrasive resistance qualities result from improved plastic insulated wire in the coils.
3. Important slot space is saved by improved plastic slot insulation. Extremely tough with higher dielectric resistance.
4. Unusual resistance to abrasion, moisture and heat is provided by improved thermal setting plastic varnish insulation on windings.
5. Squirrel cage rotors are more uniform because of improved high-pressure die-cast aluminum rotors. Individually, dynamically balanced.
6. Increased cooling ability is provided by improved ventilation.
7. These new Century Motors incorporate all mechanical features proved effective in thousands of varying applications.

For full details on Century Fractional H. P. Motors—write for bulletin 1-5 Page 1. Century also offers a wide range of types and sizes in AC and DC . . . 1/8 to 400 H. P.

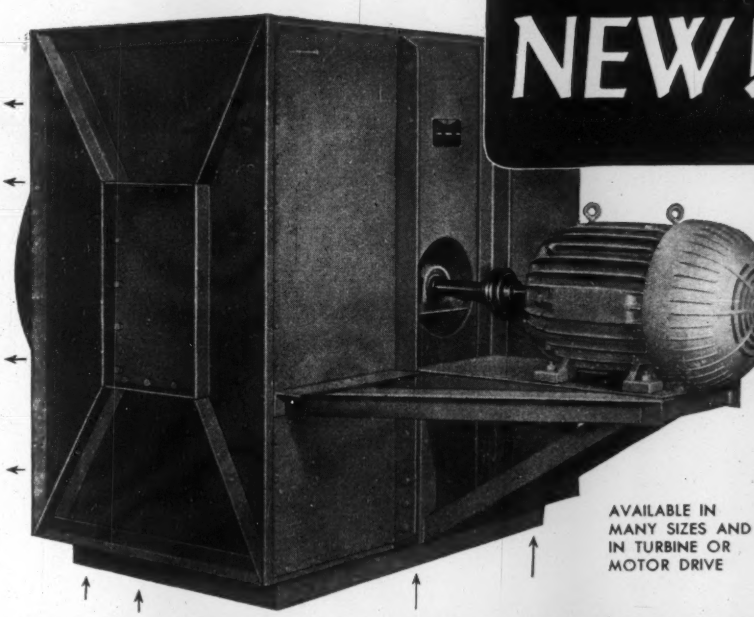
Century C MOTORS

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

832

NEW!



AVAILABLE IN
MANY SIZES AND
IN TURBINE OR
MOTOR DRIVE

WING PACKAGE DRAFT INDUCER

FOR POWER PLANTS

MOTOR AND FAN DESIGNED AS ONE COMPLETE REMOVABLE UNIT
MAKES INSTALLATION EASIER
FACILITATES INSPECTION AND MAINTENANCE
SAVES SPACE
ELIMINATES WATER COOLING OF BEARINGS
INTERCHANGEABLE INLETS—TOP, BOTTOM OR SIDES
NO LUBRICATION REQUIRED —BEARINGS PRE-SEALED

Write for complete details

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140 Vreeland Mills Road
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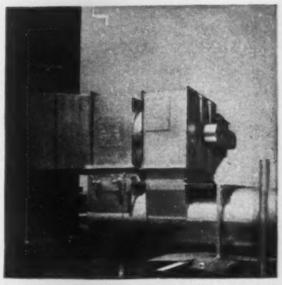
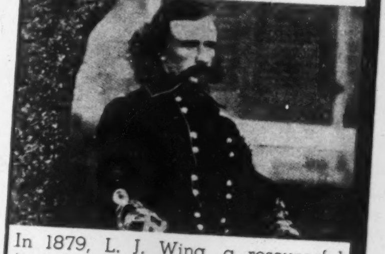
Factories: Linden, N. J.
and Montreal, Canada

OUR 75TH 1879 YEAR
Wing

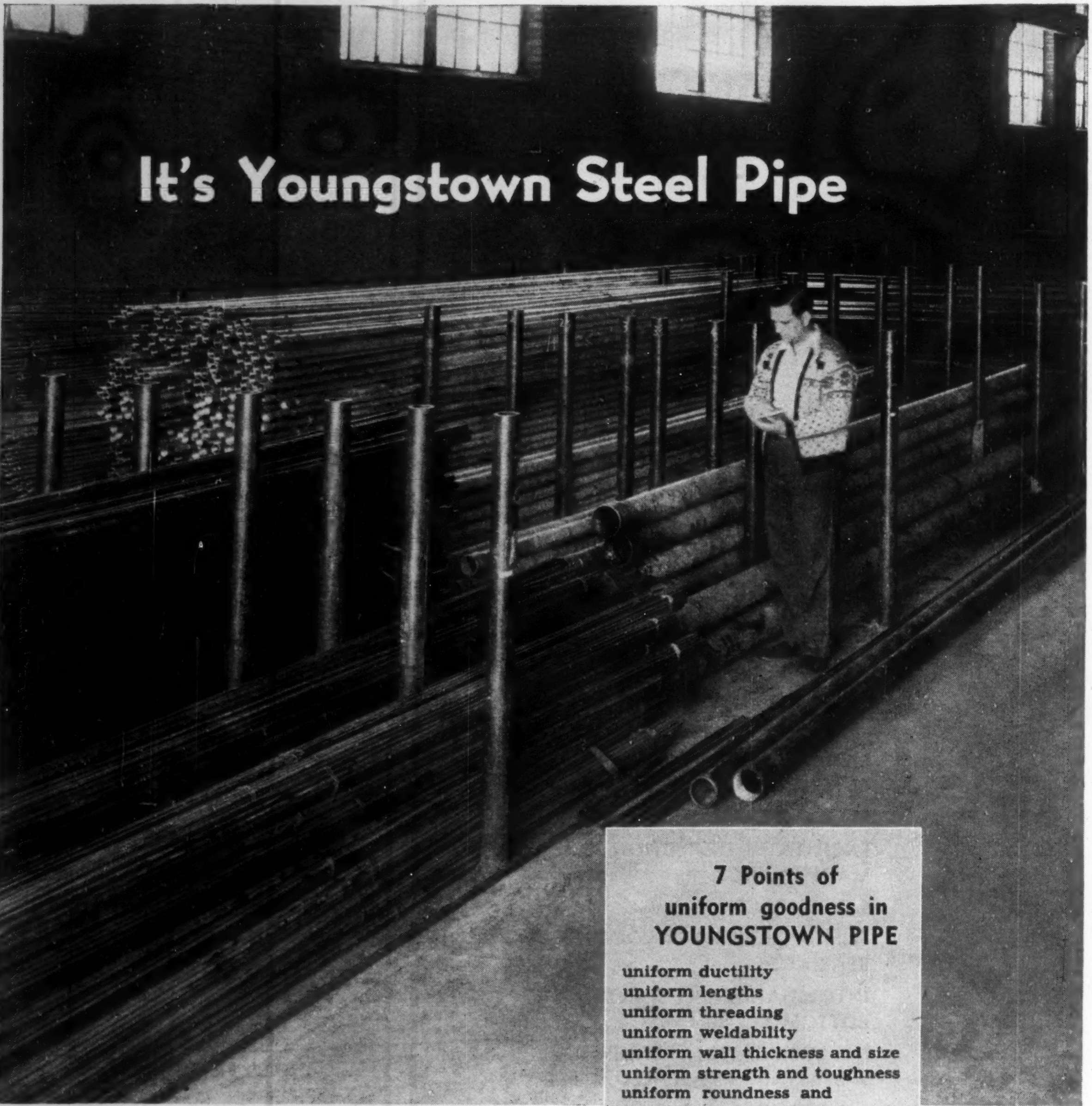


WING PACKAGE DRAFT INDUCER AT PLANT OF WELCH GRAPE JUICE CO.

SEVENTY-FIVE YEARS AGO



In 1879, L. J. Wing, a resourceful inventor, founded the company that is now celebrating its 75th anniversary. Three years before, when Mr. Wing invented the Disc Fan that bore his name, General George A. Custer (above) and 276 soldiers of the 7th Cavalry were massacred at the Battle of the Little Big Horn in Montana, by Indian tribes led by Sitting Bull, the prophet.



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From New York to Buffalo ...it's Sarcotherm at every point

427 MILE NEW YORK STATE THRUWAY

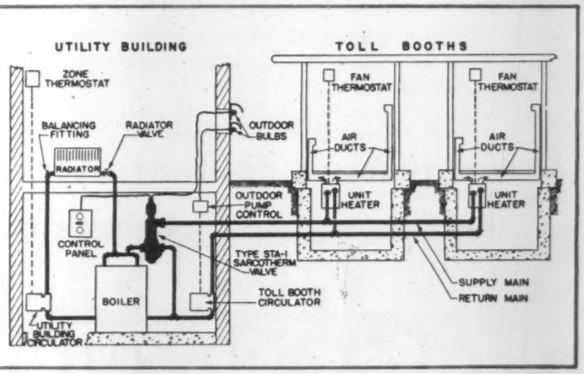
At all 40 toll interchanges heating systems controlled by Sarcotherm Weather-Compensated Systems

Here in effect is a heating system which stretches from the southeastern to the northwestern extremities of New York State.

It is obvious, therefore, that such a system must be so simple, so fool-proof, so utterly dependable, that any possibility of breakdown or other trouble will be reduced to an absolute minimum.

That is why *reliability* received so much attention from the Thruway's heating engineers. And that is one of the principal reasons why Sarcotherm Weather-Compensated Control Systems are installed in all 40 toll interchanges.

At each toll barrier a Sarcotherm Weather-Compensated Control System, calibrated to the design temperature for the particular locality, automatically proportions supply water to unit heaters in individual booths. Room thermostats control fan motors.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TOLL BOOTHS
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FAN THERMOSTAT
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AIR DUCTS
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RADIATOR
OUTDOOR PUMP CONTROL
UNIT HEATER
UNIT HEATER
CONTROL PANEL
TYPE STA-I SARCOTHERM VALVE
SUPPLY MAIN
RETURN MAIN
BOILER
TOLL BOOTH CIRCULATOR
UTILITY BUILDING CIRCULATOR

Advantages of Sarcotherm Systems

Easy to install — tailor-made drawings and diagrams of the complete system are furnished for each job.

Easy to maintain — by regular maintenance men, because of simplicity; fewer parts, such as transformers, relays.

Easy to adjust — to any desired setting.

Complete control system — including all specialties such as radiator valves, balancing fittings — all from one manufacturer, Sarcotherm. Unit responsibility.

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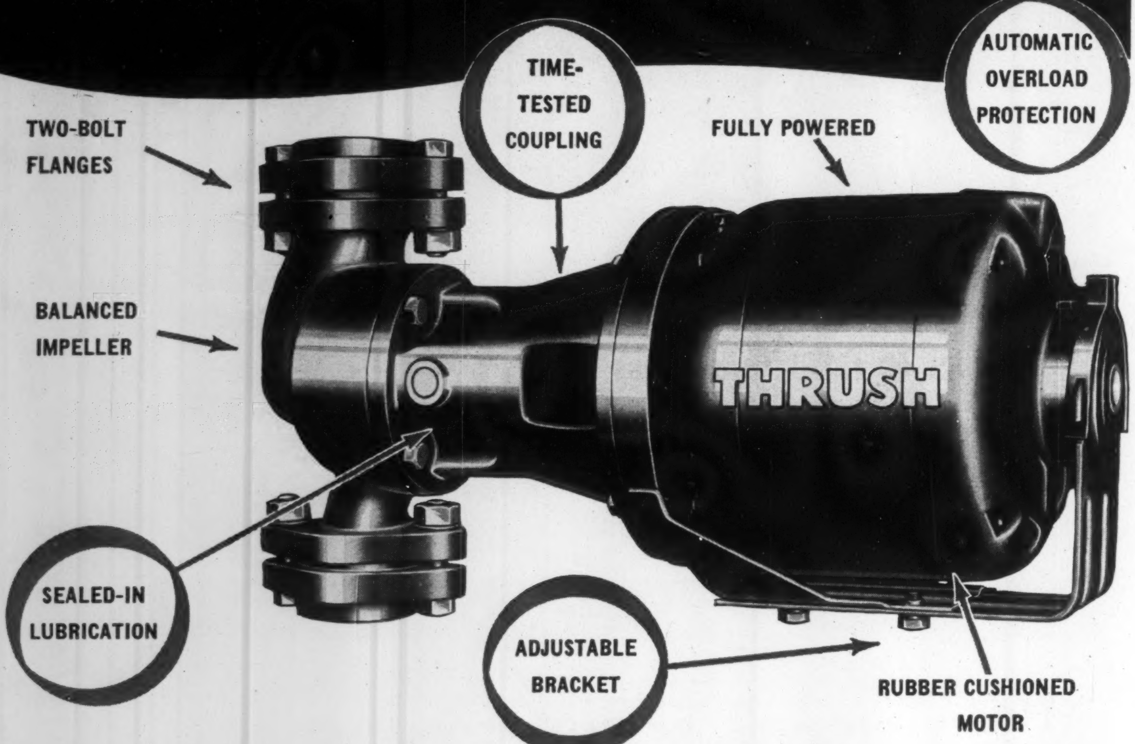
Weather-Compensated Control Systems for **HOT WATER, RADIANT AND STEAM** *Heating*

IMPROVED! to give you more Circulator for your money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ADJUSTABLE BRACKET
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QUIETER • GREATER CAPACITY • RUGGEDLY BUILT • COMPACT

FOR REAL dependability and fine performance choose Thrush Water Circulators. Time-tested design, improved in efficiency, increased in capacity, with job-rated power for each size . . . Thrush offers the greatest value per dollar in Circulators today.

The rubber-cushioned motor mounting eliminates noise and vibration. The adjustable bracket makes motor change easy. The patented spring coupling transmits power evenly. It's trouble-free. Lubrication is sealed in . . . with double seals that rarely if ever need replacement.

See your wholesaler today or write Dept. E-10.

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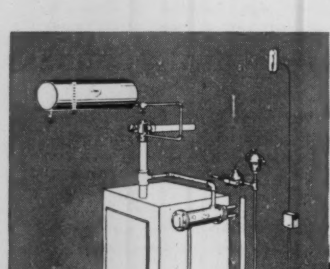
Complete Thrush System

THRUSH Water Circulators

—because we're Specialists IN CLEAN AIR

TRION

TRION ELECTRONIC AIR CLEANERS *lead the field in*

DESIGN SIMPLICITY

Trion Electronic Air Cleaners contain no moving parts, are lightweight and can be easily stacked for large installations.

EASE OF INSTALLATION

Trion units can be easily attached to the present ductwork and, after completion of installation, require practically no additional service.

UNITIZED CONSTRUCTION

Each of the component parts of a Trion Electronic Air Cleaner can be easily assembled and disassembled without disturbing other parts.

CUSTOMER SATISFACTION

Testimonial letters have been received from all over the world from persons who are enjoying the benefits of Trionized* air.

Write for the detailed story of Trion—fully described in free Bulletin E-60.

TRION

TRION, INC.
1000 Island Avenue · McKees Rocks, Pa.
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An Announcement of Importance to Everyone in the Engineering Field
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CARTRIDGE UNIT
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BALL BEARING UNITS
REDUCE
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SEALMASTER'S *New*

Rubber Mounted - Zone Hardened

BALL BEARING UNITS

REDUCE NOISE, VIBRATION AND WEAR!

Here's new proof that the real advances in design and engineering come from SEALMASTER! This new Rubber Mounted, Zone Hardened Ball Bearing Unit — another SEALMASTER patented exclusive — is now in full production.

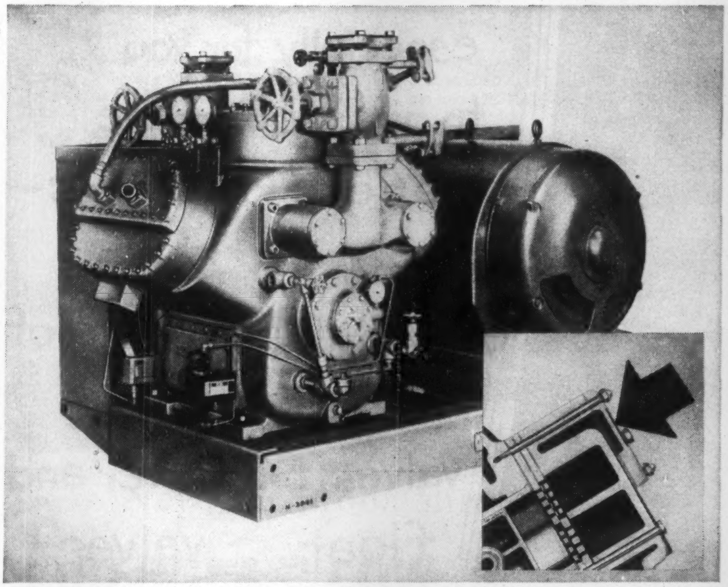
LUBRICATED AT PLANT
and
SEALED FOR LIFE!

Any manufacturer interested in quieter operation and smoother performance for his product will find the answer in this new bearing unit. Designed to reduce noise and vibration — a Zone Hardened SEALMASTER Ball Bearing Unit is mounted in a synthetic, oil-resistant rubber ring which fits snugly into a pressed steel housing — pillow block or flange type. Cartridge units are also available for insertion in special and built-in housings. Whether your product is on the drawing board or the production line, you'll want further information about the features of this new bearing unit.

Bulletin 1253 gives full information on the SEALMASTER Rubber Mounted line. Write for it today!

SEALMASTER BEARINGS A DIVISION OF STEPHENS - ADAMSON MFG. CO • 47 RIDGEWAY AVE., AURORA, ILL.

Look at all the features of Worthington's new high-speed ammonia compressor



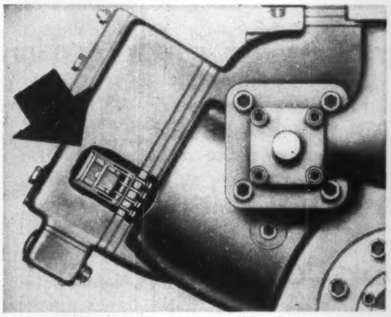
IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings. Cross section shows water jacketing on one of the cylinders.

High operating efficiency and lighter weight make this modern unit the talk of the industry

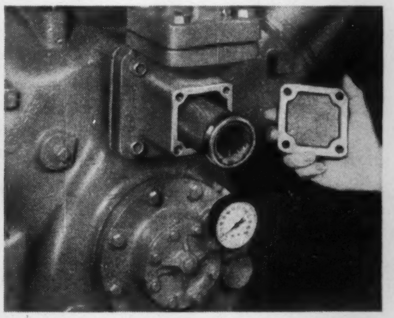
These lightweight, compact Worthington ammonia compressors have the same high operating efficiency and versatility as their lower speed counterparts.

Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines.

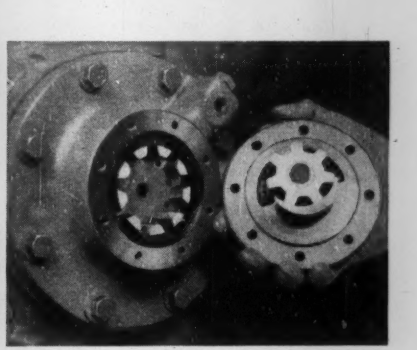
Get in touch with your nearest Worthington district office for more facts about these rugged compressors. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.56, Holyoke, Mass.



ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor with a normal torque motor; power consumption is automatically balanced against load. Separate unloader units allow easy maintenance . . . no oil or gas pressure lines to worry about.



NEW SUCTION MANIFOLD, with cover plate over suction strainer inlet, allows easy removal of the suction gas strainer for cleaning, without disturbing any of the pipes, valves or other parts. The strainer is unique in that it fits entirely within the crankcase manifold, requiring no additional space.



NEW FORCE-FEED LUBRICATION SYSTEM—full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Oil is filtered through a strainer in the crankcase for protection of pump and other moving parts.

A.3.56

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PILOT OPERATED STEAM PRESSURE REDUCING VALVE
PILOT OPERATED STEAM PRESSURE REDUCING VALVE

Typical pages showing the famous Fisher Type 92A Pilot Operated Steam Pressure Reducing Valve. Detailed information includes application data, features, sizes, capacity tables, operation and installation drawings.

. . . this FISHER catalog is designed especially for you to give you complete specifications—capacity and application data of pressure reducing valves . . . lever and float valves . . . strainers You'll find it a treasure chest of information in your business so why not write for your copy today!

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A pipe dream come true!

Made in pre-formed sections, new Fiberglas Low Pressure Pipe Insulation is easily and economically applied. Comes in sizes to fit standard pipe up to 12", all copper tubing up to 3" in diameter. Suitable finishes, including vapor barrier jackets for cold line anti-sweat purposes, *are factory applied.*

New, rot-proof, shrink-proof, high thermal efficiency

FIBERGLAS* LOW PRESSURE PIPE INSULATION

for low pressure steam lines, hot and cold water lines!

The problem is solved—no more rotting, shrinking, adsorbent, *costly* insulation on your low pressure steam lines, your hot and cold water lines!

New Fiberglas Low Pressure Pipe Insulation is here—the first major improvement in low pressure pipe insulation in over 30 years—tested and proved in three years of trial applications!

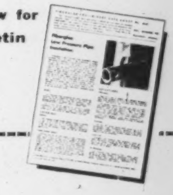
Made of inert fibers of glass, this pipe dream come true will not rot, shrink, swell, buckle, or sag. It's lightweight, resilient, moisture resistant, *and up to 50% more efficient thermally than old insulations used in low pressure service.* Best of all . . .

New Fiberglas Low Pressure Pipe Insulation is priced right in line with ordinary insulations!

Which means that for any given installation it's actually cheaper. For thanks to higher efficiency, ½" of Fiberglas Low Pressure Pipe Insulation does the same insulating job on hot piping as 1" of less efficient old type insulation —and it lasts and lasts. The properly located vapor barrier (on outside of insulation) helps avoid condensation, adsorption and resultant corrosion of pipe and deterioration of insulation.

Whatever the application—low pressure steam, hot water or anti-sweat for cold water lines—Fiberglas Low Pressure Pipe Insulation pays for itself time and time again. Moreover, it's easy to cut and handle, fast and economical to install.

Mail coupon now for new 4-page bulletin giving full technical data!



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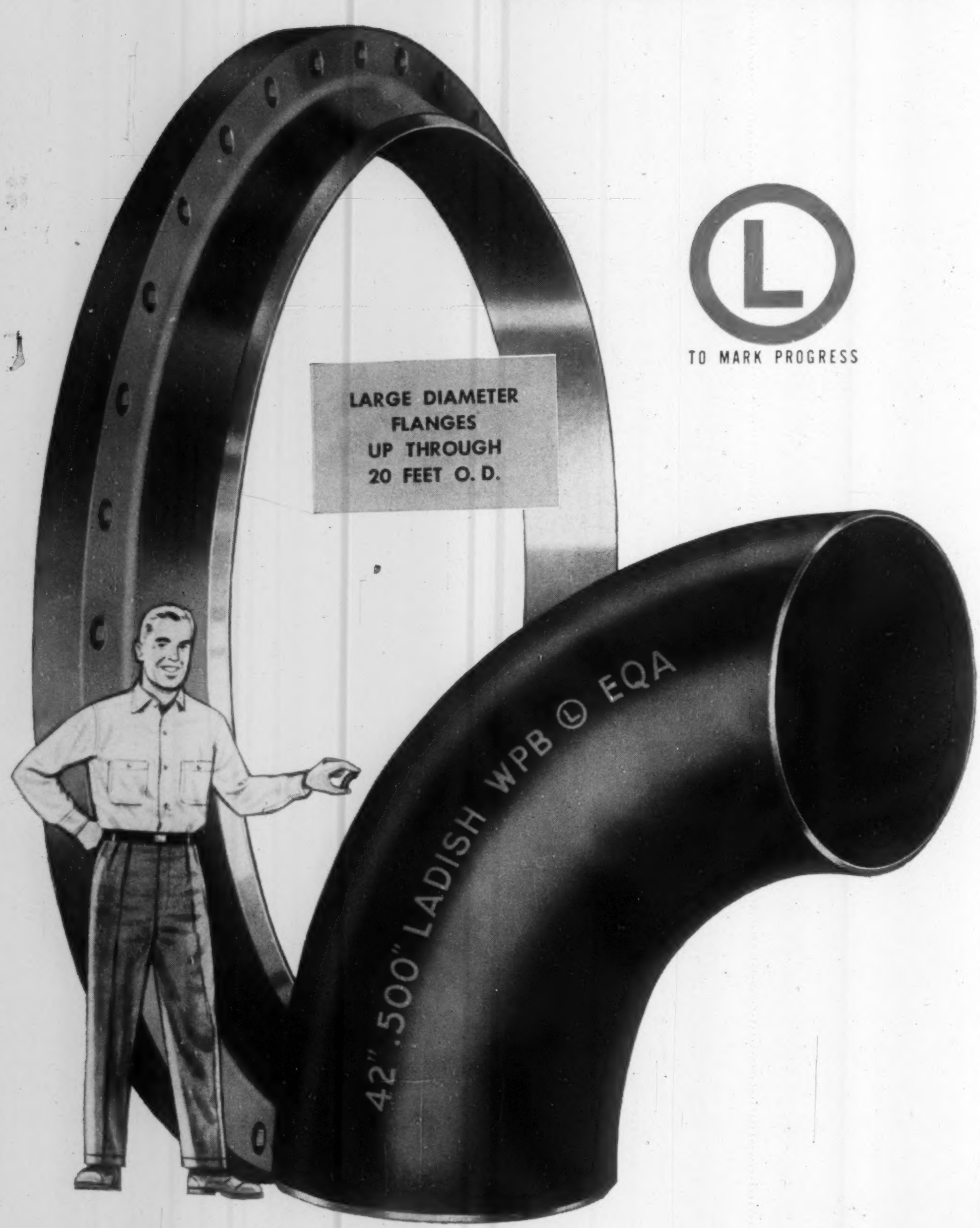

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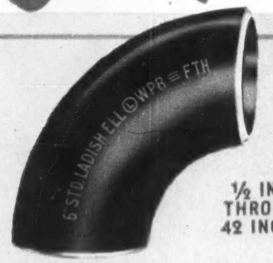
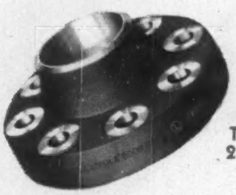
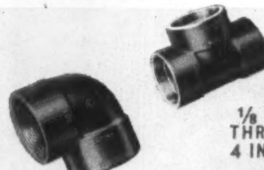


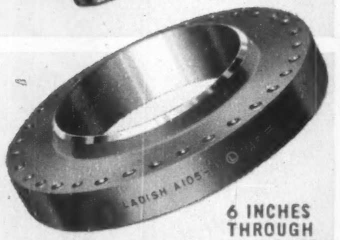
½ INCH
THROUGH
42 INCHES



½ INCH
THROUGH
24 INCHES

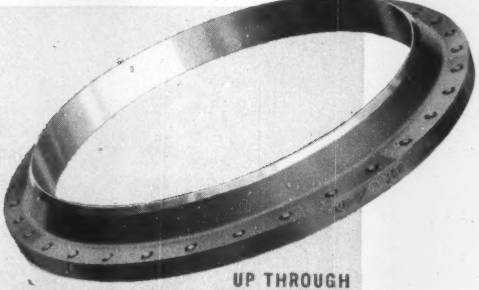


⅛ INCH
THROUGH
4 INCHES



6 INCHES
THROUGH
46 INCHES

½ INCH
THROUGH
24 INCHES



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PRODUCED TO ONE STANDARD OF UNSURPASSED QUALITY

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CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
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illinois

FLOAT AND THERMOSTATIC TRAPS

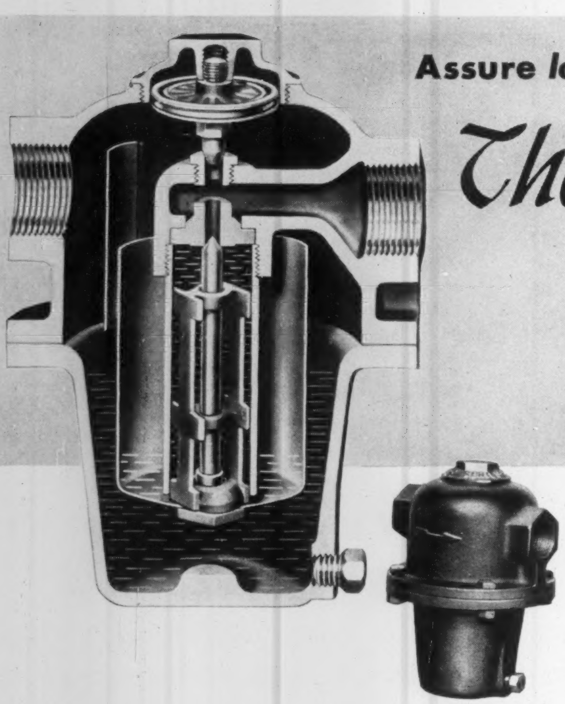
SERIES G • FOR LOW PRESSURE STEAM SERVICE

Assure *lower* return line temperatures

They're different!

–in construction

–in performance



Recommended Applications . . .

Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Process Heaters, Hot Water Generators, Drips of Mains and Risers.

Illinois Float and Thermostatic traps operate under vacuum with the same high efficiency as under pressure. No more water-logging in mains…no more air pockets…put an end to "morning overload" troubles. The condensate control valve provides complete and instantaneous drainage of condensate while a separate thermostatically controlled valve in cover vents air in large volume, yet prevents loss of valuable steam.

The condensate valve is actuated by impact when the float drops—a snap action that is independent of the rate of flow of the condensate. Valve is not directly attached to the float and is either tightly closed or wide open. This instantaneous operation makes wire drawing impossible.

Illinois traps, because of their unique valve action, function perfectly at all load conditions, with lower return line temperatures than ordinary type traps. Lower return line temperatures assure higher vacuum pump efficiency. Straight through connections save head room, fittings, labor. Trap is easily opened for inspection. It is not damaged by freezing. Sizes from ¾ inch to 2 inches.

Write for Bulletin

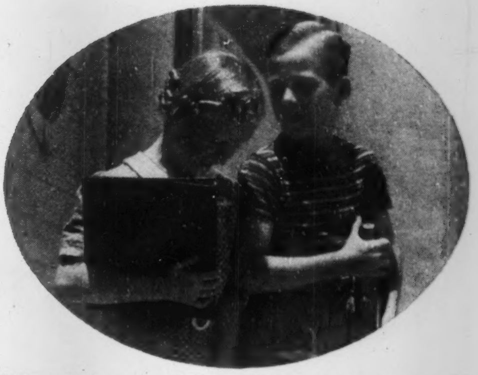
illinois ENGINEERING

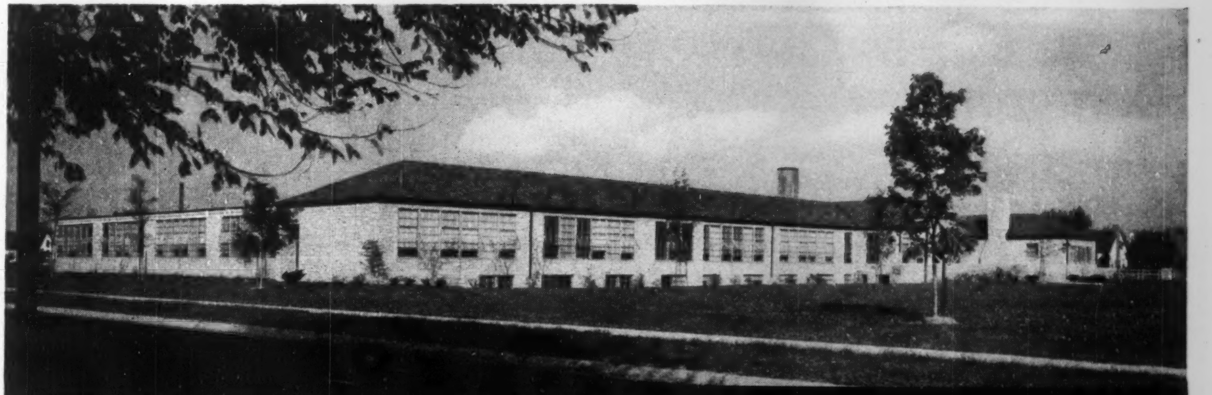
ILLINOIS ENGINEERING COMPANY

2049 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

YOU CAN'T PUT A PRICE TAG ON THEIR FUTURE





Maryland Elementary School, Bexley, Ohio • Architect, Sims, Cornelius & Schooley, Columbus, Ohio • Heating Contractor, The Gesling Plumbing Co., Inc., Lancaster, Ohio

KEWANEE Reserve Plus Rated boilers certify heat to meet all conditions

One of America's greatest assets is school children . . . from their ranks come the leaders of tomorrow. Their well-being depends on adequate facilities to guard health . . . meet future needs. There can be no price tag here so thoughtful school boards and those who design, build and equip the nation's schools, plan wisely. Take the matter of heat. There must be enough boiler capacity to provide healthful temperatures. Because every Kewanee Boiler is certified to deliver 50% extra reserve power, adequate heat is always available. Kewanee Reserve Plus Rated Boilers guarantee enough power for any emergency . . . for fluctuating demands, and equally important, they provide for expansion. School enrollment is growing at the fastest tempo ever, so the need for rapid expansion is often critical.

Be sure you follow the Kewanee Reserve Plus Rating Plan in considering boilers. Know these important facts:

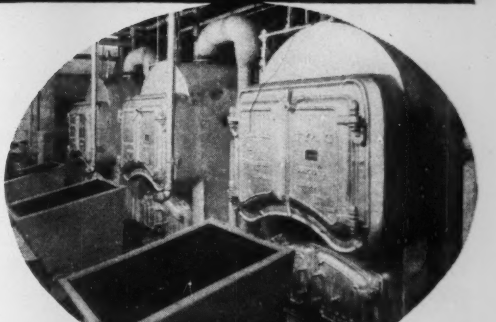
1—*Boiler rating must be based on nominal capacity, not maximum capacity;*

2—*Boilers must have sufficient built-in reserve to meet changing demands;*

3—*Boilers must have sufficient capacity to operate at "cruising speed," not maximum speed at all times;*

4—*Like examples must be considered in comparing boilers. Don't be confused by vague technical claims.*

Choose Kewanee and cut fuel costs—lower maintenance—reduce breakdowns—get longer boiler life.



Three 7L79 Kewanee Type "C" Boilers used in the Maryland Elementary School. Student health is protected because there's sufficient reserve to meet every need . . . provision for expansion, too.

KEWANEE BOILERS

KEWANEE-ROSS CORPORATION, Kewanee, Illinois
Division of American Radiator & Standard Sanitary Corporation

Serving home and industry · American-Standard · American Blower
Church Seats & Wall Tile · Detroit Controls · Kewanee Boilers
Ross Exchangers · Sunbeam Air Conditioners

YOU can depend on KEWANEE engineering

COLD FACTS

You want *dependable* refrigeration. Then depend on Pritchard heavy-duty cooling towers! Why? Because every Pritchard tower is guaranteed to meet your exacting refrigeration or comfort cooling requirements. Pritchard cooling towers are adequately sized, accurately engineered and carefully constructed. Next time you want the right answer to your cooling problems, contact Pritchard—a founder member of the Cooling Tower Institute.

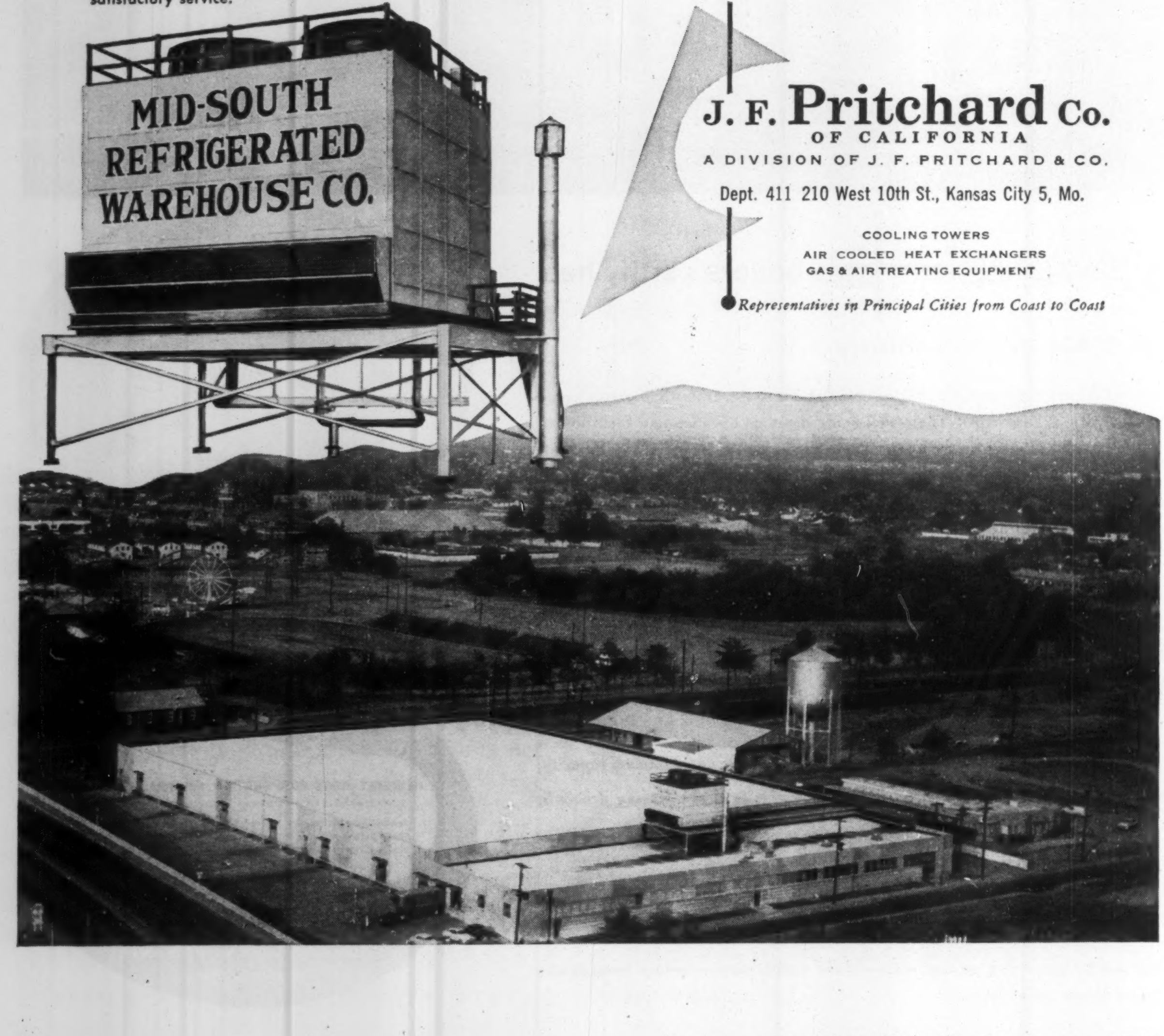
Industry's Partner for Progress

J. F. Pritchard Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 411 210 West 10th St., Kansas City 5, Mo.

COOLING TOWERS
AIR COOLED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

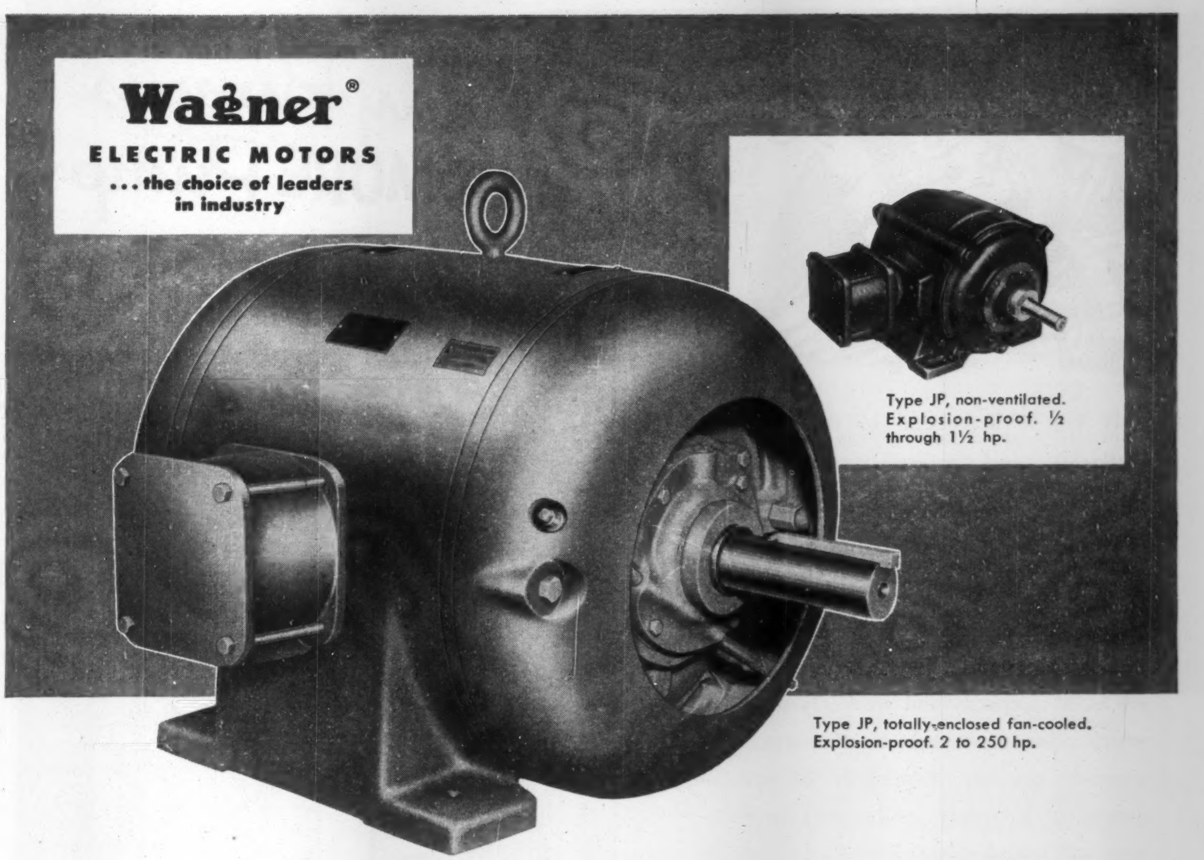
Representatives in Principal Cities from Coast to Coast

Pritchard-built for continuous, satisfactory service.



Wagner®

ELECTRIC MOTORS
...the choice of leaders in industry



Type JP, non-ventilated. Explosion-proof. ½ through 1½ hp.

Type JP, totally-enclosed fan-cooled. Explosion-proof. 2 to 250 hp.

for extra protection against corrosion

SPECIFY **Wagner** *CAST IRON FRAME MOTORS*

Here are stock motors specifically designed for use in chemical plants, oil fields, refineries, steel mills—for rugged industrial applications where dust, dirt, moisture, or corrosive vapors are present.

These motors are totally-enclosed in corrosion-resistant cast iron and all parts exposed to the atmosphere are of corrosion-resistant material—including the nameplate. They feature completely protected laminations . . . special varnish treated windings . . . and a running shaft seal.

Wagner Cast Iron Frame Motors are available in fan-cooled standard and explosion-proof types in ratings from 2 to 250 hp, and in non-ventilated standard and explosion-proof types in ratings from ½ through 1½ hp. Wagner Bulletin MU-132 gives complete information.

A skilled Wagner engineer can help you select a Wagner Motor to meet your most exacting specifications. Call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation
EST. WE 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

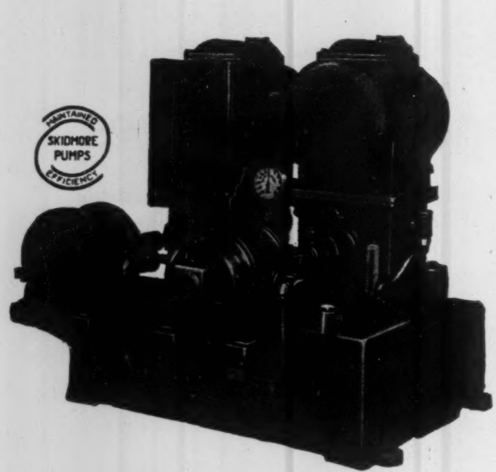
ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

M54-8

The Quality Pump is
the SKIDMORE Pump

If you're interested in reducing installation and maintenance costs — don't overlook Skidmore's wide range of exceptionally dependable pumps.

Designed specifically for every installation requirement . . . Skidmore Pumps are built compactly and are easily installed, whether for below floor level returns or in cramped quarters. Experience of over a quarter of a century insures peak performance and longer service life.



SKIDMORE VACUUM PUMP

Automatically adjust to the varying conditions of the system. Capacities — ranging from 5,000 to 100,000 sq. ft. EDR. Available in both single and duplex units.

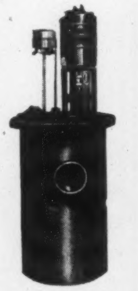
SKIDMORE PUMPS

SKIDMORE CORPORATION **St. Joseph, Michigan**

. . . FOR A SPECIFIC PUMP REQUIREMENT.

If you are faced with the responsibility of a choice, Skidmore offers many types and units for you to select the correct design to meet your individual requirements.

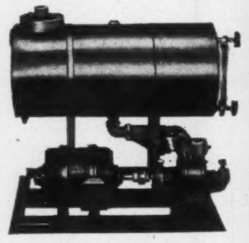
Type UV Condensation Pump is designed for below floor level returns, and is built in single and duplex units.


Type UV Condensate Pump

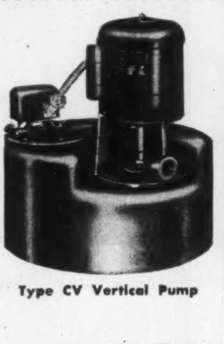
Type HS Pump is recognized for its dependable low operating cost. Capacities range from 1,000 to 65,000 sq. ft. EDR and pressures from 10 to 75 pounds.

Type HS Condensate Pump

Type TM High Pressure Turbine Pump. Designed for pressures up to 150 pounds and boilers to 250 H.P.


Type TM Turbine Pump

Type CV Vertical Pump is ideal where space is limited. This model like every Skidmore Pump is built to meet specific requirements. For the correct solution to your own pump problem consult a Skidmore Heating Pump Specialist.


Type CV Vertical Pump

IMPROVED DESIGN!
WIDER RANGE!
SPENCER
TYPE "C"

SPENCER "C" BOILERS

For Larger Homes, Motels, Schools, Churches, Apartments Commercial and Industrial Buildings

Capacity Range: 1100 to 5000 sq. ft. steam net rating
1760 to 8000 sq. ft. water net rating

SPENCER'S

POPULAR "C" BOILERS NOW OFFER NEW FEATURES . . . NEW SIZES . . . MORE ATTRACTIVE PRICES!

Now, the most popular series in Spencer's quality line of boilers is available for a wider range of jobs . . . and at more attractive prices.

Improved design now makes this outstanding boiler available with standard 15″ base or extra base heights, at nominal charge, for special fuel-burning installations. Four new larger models, with heavy 3″ fire tubes, have been added to the line, providing greater range in application.

Here are some of the outstanding features of the Spencer "C" Boilers: water-cooled, precision-ground flue and fire-door frames, equipped with heavy cast-iron insulated doors; extra-heavy steel-plate smokeboxes; staggered boiler tubes for rapid heat transfer; service water-heating coils in many capacities.

Entire boiler line available with attractive standard jackets, insulated with glass wool, with beautiful blue-gray hammerloy finish.

Any fuel can be fired in the Spencer "C" Boilers. Easily and quickly converted from hand to automatic firing.

For any job—residential, industrial or commercial—requiring 1100 to 5000-sq.-ft. net load steam, low pressure, specify one of Spencer's "C" Series. *Save dollars and provide the highest quality heating plant available.*

SPENCER
HEATER
LYCOMING DIVISION
WILLIAMSPORT AVCO PENNSYLVANIA

Spencer Heaters—Dept. HP-104
Lycoming Division
AVCO Manufacturing Corp.
Williamsport, Pennsylvania

Dear Sirs:
Please send additional information and specifications on the new Spencer "C" Series Boilers to:

Name__________
Position__________
Company__________
Address__________
City_____ Zone_____ State_____

TAILORING GLASS FIBERS FOR THE Roll-O-MATIC!

Roll-O-MATIC
Automatic Renewable Media Air Filter

New Media Makes Possible Today's Most Maintenance-Free Air Filter

THEY'RE stretching glass—just one of the many steps involved in its conversion to an efficient, low cost filtering media for the new ROLL-O-MATIC. In final form, it consists of a thick "blanket" of bonded glass fibers possessing the cleaning efficiency, dust holding capacity and high velocity rating of a viscous filtering media, yet a material that can be made in lengths up to 70 feet and is sufficiently resilient and flexible to permit packaging in compact 13" diameter rolls.

With the development of this versatile media, the mechanics of ROLL-O-MATIC design were easy. Mounted in roll form at top of filter, the media moves as a continuous curtain down the face of the ROLL-O-MATIC, and is rerolled on a driven spool at bottom. Movement of media is controlled by an automatic time switch which introduces sufficient clean material into air stream to maintain the desired operating resistance.

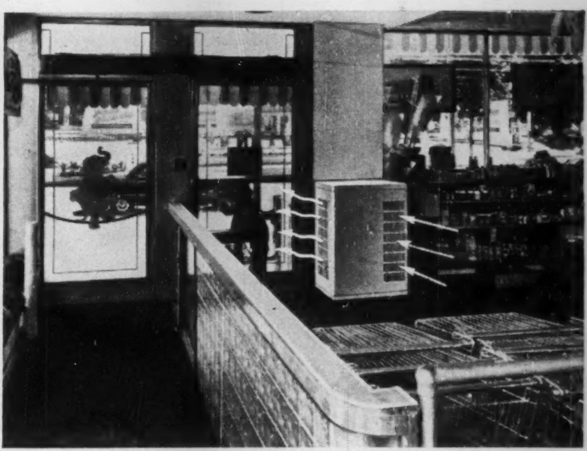
What's the end result of all this for the user? Continuous, high efficiency cleaning at an operating cost less than half that of a disposable type filter of equal capacity! For complete facts, contact your local AAF representative or write for ROLL-O-MATIC Bulletin No. 248.

AAF **American Air Filter**
COMPANY, INC.

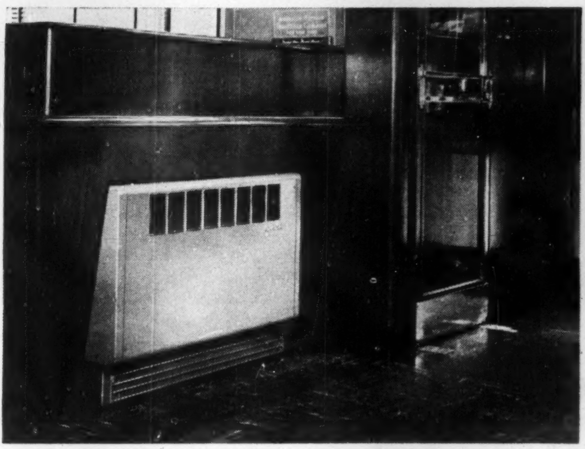
American Air Filter of Canada, Ltd., Montreal, P. Q. • 373 Central Avenue, Louisville 8, Kentucky

CAMPUS CASUALS

CEILING MOUNTED Type BT Cabinet, connected to duct with inlet at floor level, replaced a bulky, unattractive cast iron radiator that formerly was located below show window.



BLANKETING OPENING DOORS with a curtain of heated air, Modine Type FE Cabinet Unit protects customers and employees of this supermarket from the coldest wintry blasts.



RECESSED IN THE WALL and blending unobtrusively with the modern decor, a Modine Type BF Cabinet Unit provides economical heating, requires almost no floor space.

HARD-TO-HEAT CHURCHES offer no problems for Modine Cabinet Units. Here cold air, drawn into opening in bottom of unit, is heated and discharged through wall grille.

SEE YOUR HEATING JOB HERE?

Then Modine Cabinet Units are your low-cost answer!

YES, for the steam and hot water heating applications pictured above—and hundreds of others—versatile Modine Cabinet Units provide economical comfort. Quiet blower fans assure positive yet gentle circulation of heated air. Some models have provision for cooling with chilled water.

What's more, Cabinet Units' attractive appearance—plus their ability to replace at least two or three cast iron radiators—makes them ideal for new construction or modernization. If you've a difficult heating problem, get all the facts about Cabinet Units from the Modine representative listed in your classified phone book. Or mail the handy coupon at the right.

Modine
CABINET UNITS

MODINE MFG. CO.
1509 DeKoven Ave., Racine, Wis.

Please send me immediately a free copy of Bulletin describing Modine Cabinet Units.

Name ....

Firm ....

Address ....

City .... Zn .... State ....

C-1234

How to Select an Economical Temperature Regulator

First of all, what does *economy* mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

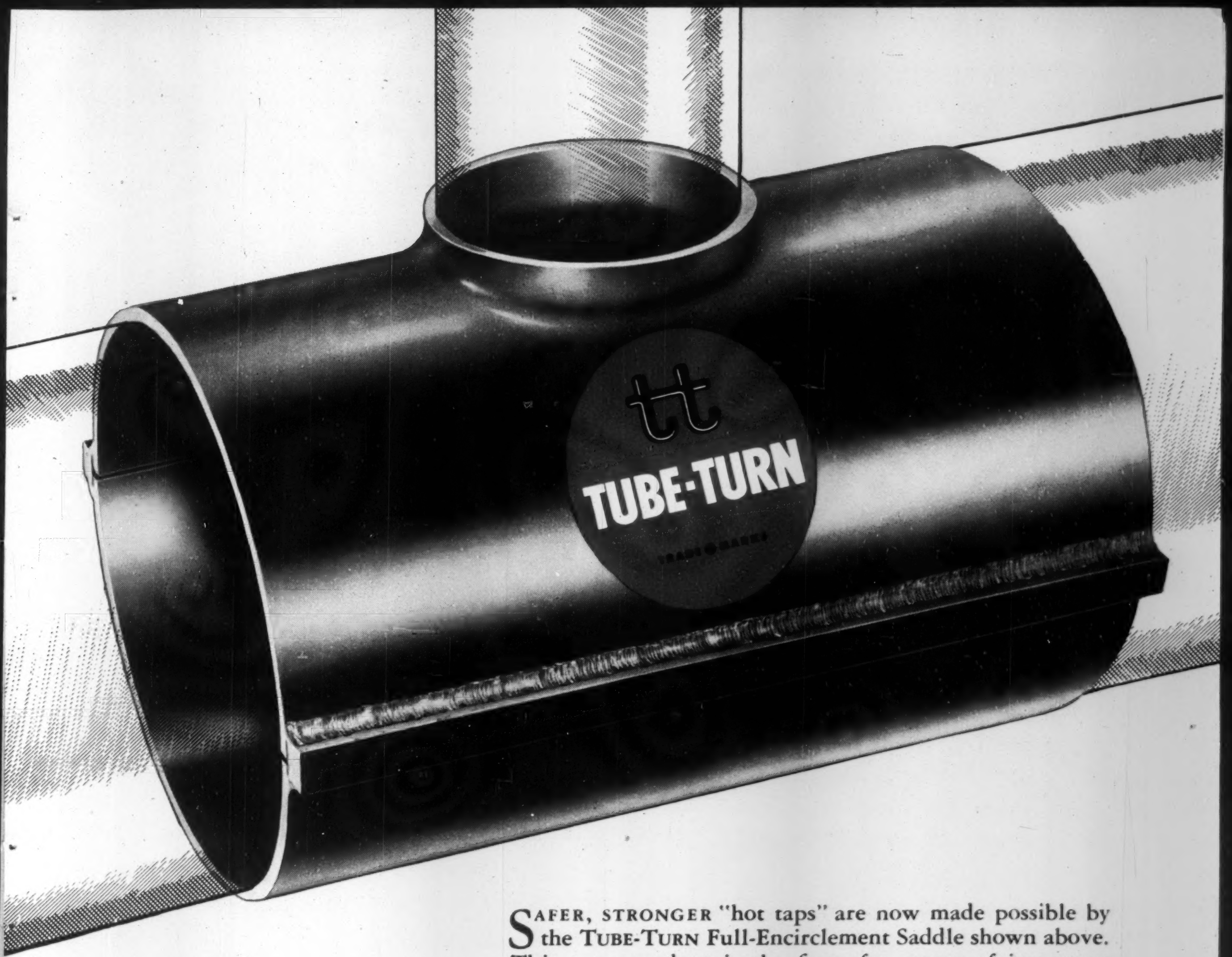
Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that *Spence* Temperature Regulators offer all these features and more. May we send you our Bulletin T500 containing further details? SE 138

SPENCE ENGINEERING COMPANY, INC.
Walden, New York



NEW!

TUBE-TURN Full-Encirclement Saddle improves "hot-tapping" of piping

SAFER, STRONGER "hot taps" are now made possible by the TUBE-TURN Full-Encirclement Saddle shown above. This new product is the first of a group of important developments of Tube Turns' unique pulsation pressure testing program.

Split longitudinally on a horizontal plane, perpendicular to the axis of the outlet, this new "hot tapping" reinforcement eliminates welds in the critical crotch area. Its installation requires a minimum amount of field welding. When used with high yield strength pipe, no welds are required between saddle and line pipe.

The TUBE-TURN Full-Encirclement Saddle is designed for high yield strength thin-wall pipe and for heavy wall cylinders used for headers, bottles and pulsation dampeners. It can be supplied for pipe sizes through 42", any outlet size, in composition and wall thickness to match service conditions.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

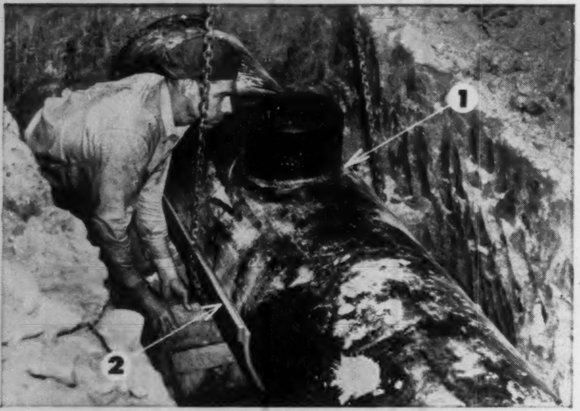
A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

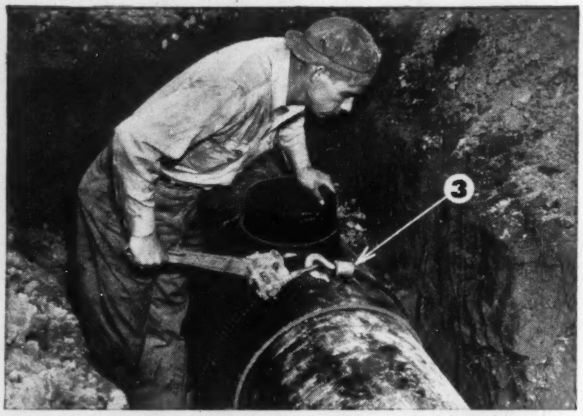
"tt" and
"TUBE-TURN"
Reg. U.S.
Pat. Off.

HOW INSTALLED

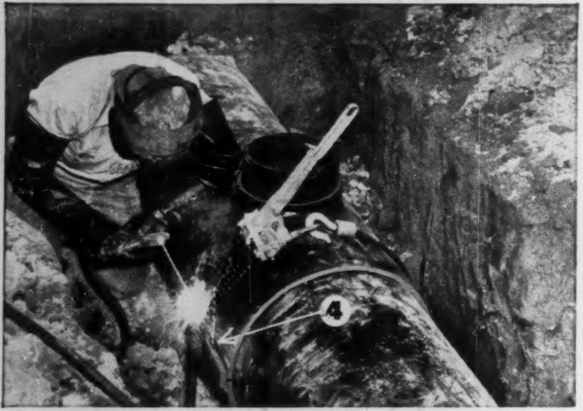
How to install the new TUBE-TURN Full-Encirclement Saddle for a "Hot Tap"



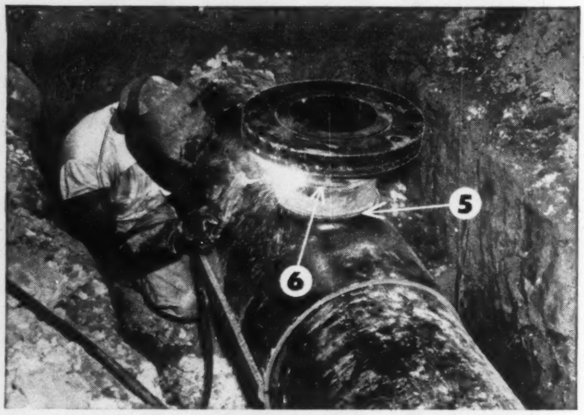
1. *Weld branch outlet pipe to run pipe according to normal procedure.*
2. *Position and block up bottom half of full-encirclement saddle.*



3. *Slip top half of full-encirclement saddle over branch outlet. Bring two halves together tightly by means of clamp such as shown.*



4. *Tack weld longitudinal lap plates to top half of saddle, remove clamp and complete welding of plates. (Plates are shop-welded to bottom half).*



5. *Fillet weld saddle outlet to branch pipe.* 6. *Join branch pipe to* TUBE-TURN *Welding Neck Flange. Normal tapping procedure follows.*

NOTE THAT when used with high yield strength, thin-wall pipe, as shown above, circumferential welds between saddle ends and run pipe are not required. This precludes possibility of failure due to underbead cracking or to local stress concentrations which exists at such attachment welds with conventional saddles or other types of "hot tap" fittings which must be fillet welded to high yield strength, thin-wall pipe. The TUBE-TURN Full-Encirclement Saddle fully meets all requirements for reinforcement of welded branch connections as developed by Section 8 of the Code for Pressure Piping.

This new, advanced design is another example of TUBE TURNS' pioneering... why it pays to do business with the leader.

tt
TUBE-TURN
TRADE MARKS

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Chicago • Denver • Los Angeles
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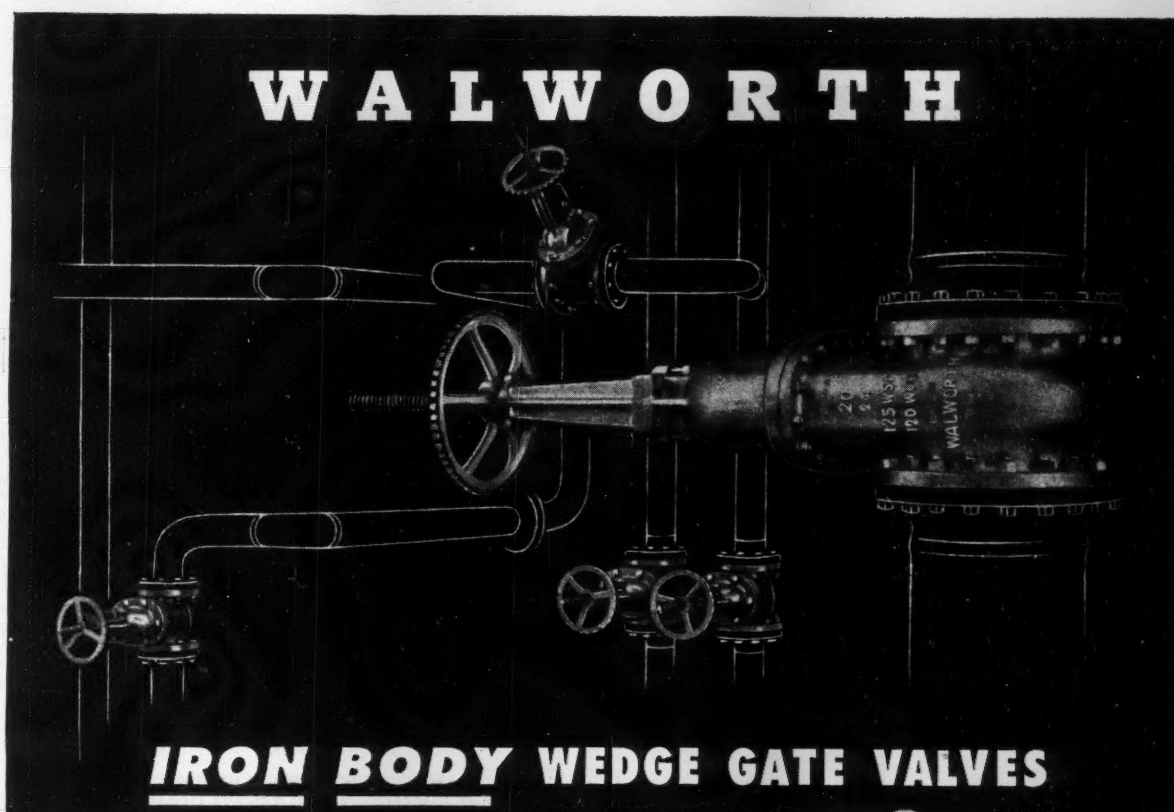
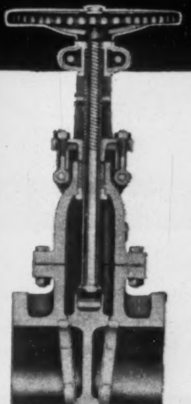




Better because **...The entire valve, from handwheel to seat rings, is ruggedly constructed to withstand rough and frequent usage. Body, bonnet, and yoke are sturdy castings with large radius fillets. Dimensions and drilling of end flanges are in agreement with American Cast Iron Flange Standards. Stiffening ribs connect end flanges with the body neck to maintain a rigid connection with piping.**

A wide range of Walworth Iron Body Wedge Gate Valves is available—through your Walworth Distributor—from which you can choose the right type to meet your most exacting conditions. Saddle-type valves as small as ¼-inch; low pressure valves for water and gas pipelines up to 36 inches.

Whenever you need valves and fittings, choose from complete lines—in a variety of metals—manufactured by Walworth. For more information, see your Walworth Distributor or write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

WALWORTH

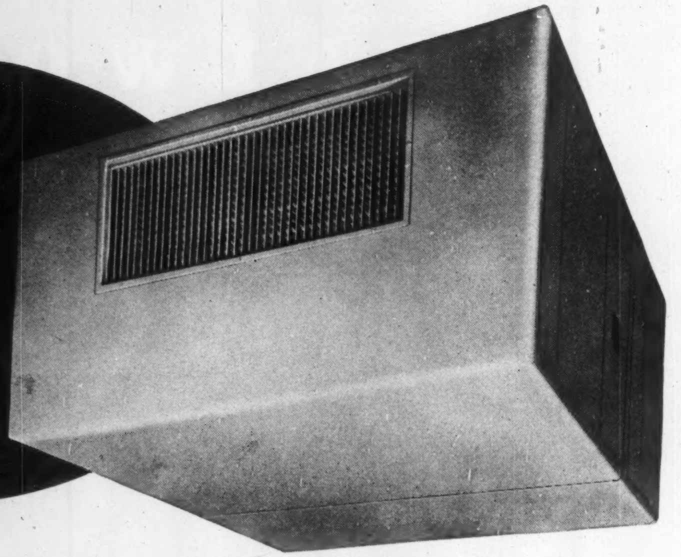
Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

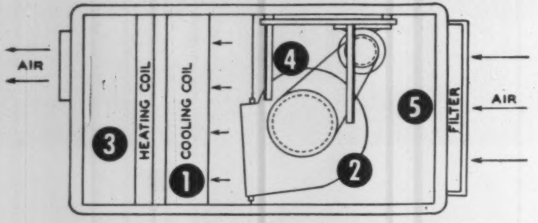
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



① MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

② "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

③ ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

④ QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

⑤ FOR FINISHED INTERIORS

Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

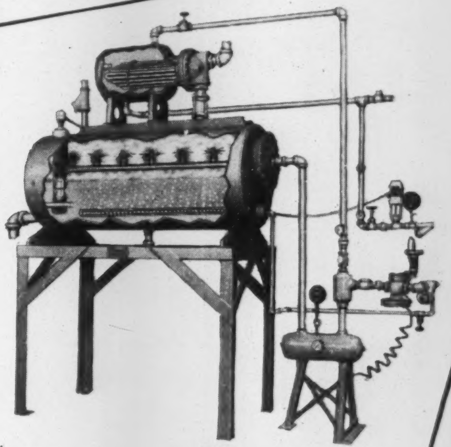
MANY OTHER OUTSTANDING FEATURES.

WRITE FOR BULLETIN AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

A FRESH LOOK INTO *Deaeration!*

SCHAUB
ZERO-OXYGEN
Deaerators



ENTIRELY NEW

in operating principle
in mechanical design
in the advantages they offer

"Newness" for its own sake is no advantage in a deaerator. But when new thinking achieves improved performance not possible with conventional designs, it's worth looking into!

The Schaub Zero-Oxygen Deaerator differs from all others in that it provides *external* pre-heating to a temperature *above* boiling point, with over-atmospheric pressure held only up to the internal sprayer manifold. The storage receiver itself is *fully vented* and operates at constant, safe atmospheric pressure.

This simple but basic difference opens the way to a whole series of better performance characteristics, including:

- LOW OPERATING COSTS
- LOW MAINTENANCE COSTS
- COMPLETE OXYGEN REMOVAL—(to .005 cc/liter)
- COMPLETE SAFETY
- WIDE RANGE FOR LOAD VARIATIONS
- SIMPLER DESIGN AND OPERATION

The "hows" and "whys" of Schaub Zero-Oxygen Deaerators make an important story for any engineer or operating man concerned with boiler feedwater deaeration. Mail the coupon and we'll send it to you.

FRED H. SCHAUB ENGINEERING COMPANY
2116 South Marshall Boulevard • Chicago 23, Illinois

SCHAUB
ZERO-OXYGEN
Deaerators

MAIL THE
COUPON FOR BULLETIN 575

Why a deaerating system? How can it save you money and trouble? What makes a good system? How to get maximum benefits at lowest cost? What are some of the engineering factors involved?

These and many other questions are answered in Schaub Bulletin 575, just off the press. It's a valuable contribution to boiler deaeration theory and practice.

FRED H. SCHAUB ENGINEERING COMPANY
2116 South Marshall Boulevard Chicago 23, Illinois

Please send me, without cost or obligation, my personal copy of your new Bulletin 575 on Boiler Feedwater Deaeration.

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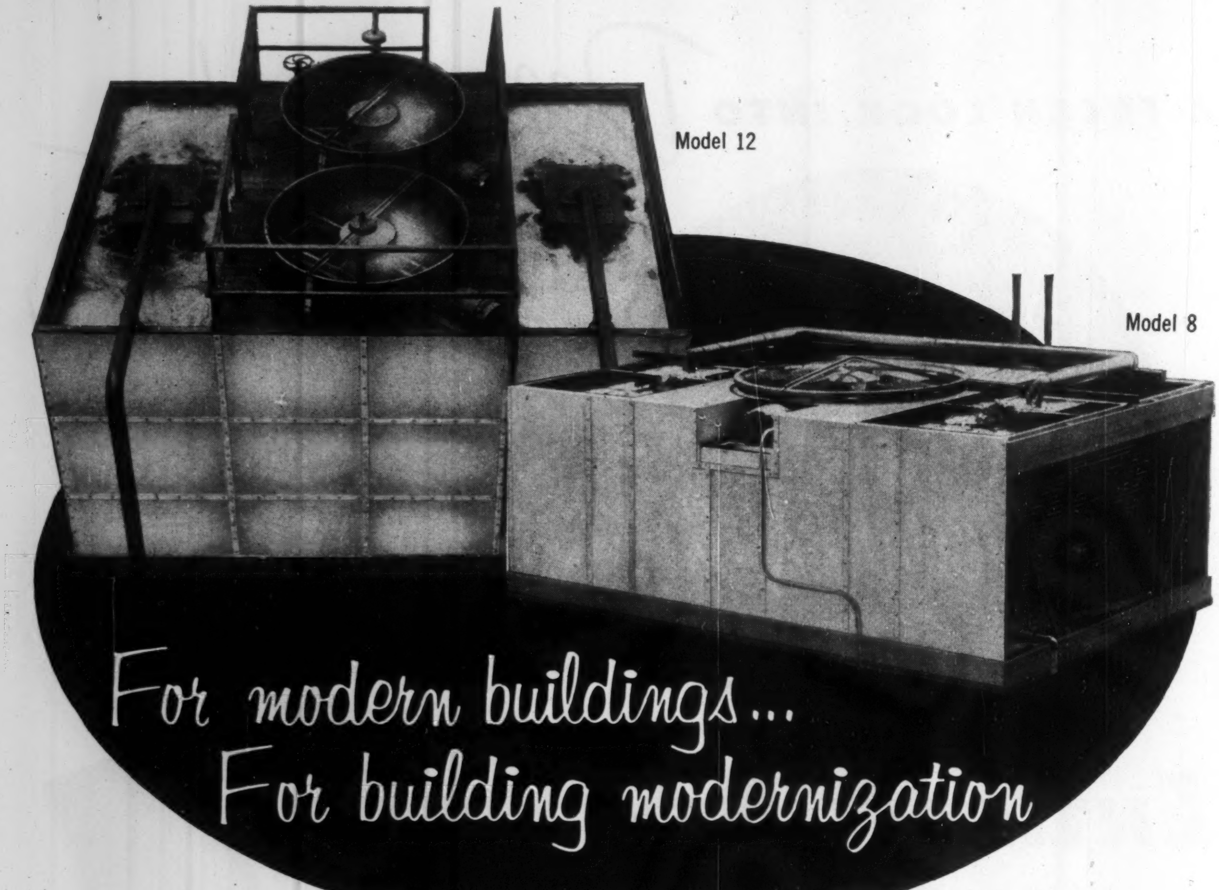
COMPANY...

ADDRESS..

CITY.......................... ZONE.... STATE.......



MARLEY DOUBLE-FLOW AQUATOWERS*

DOUBLE-FLOW AQUATOWERS DON'T TOWER! Their size-performance ratio is revolutionary. A single-cell model that efficiently cools 1,800 gpm is just eight feet high. That's why engineers and architects have made them the No. 1 selection for finest modern buildings and most extensive modernization projects.

These towers lend themselves to economical screening by masonry or wood structure and, in many cases, are completely concealed by normal parapet walls. Double-Flow Aquatowers are small in physical dimension only, for they pack highly concentrated cooling ability in every foot of plan area. They are "big tower" in every respect with open gravity distribution, double utilization of fan horsepower, close-packed, high-efficiency filling and the rugged simplicity offered only by Marley design.

Double-Flow Aquatowers are available in Models 8 and 12 in single and multi-cell units . . . they fit every application in the intermediate capacity field. Write today for Bulletin DFA or call your Marley representative in any of 55 cities for complete information on the "hottest thing in water cooling!"

MARLEY

Double-Flow design fully protected by U. S. Pat. Re21794

The Marley Company Kansas City, Missouri

*Trademark Reg.

KING
SIZE

medium

or
small

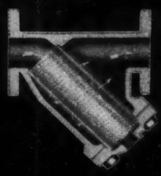
McALEAR STRAINERS meet the needs of all

When piping plans call for strainers, look to McAlear. Here's a line with the widest range ever . . . sizes from ½" to 24". All types, too . . . flanged or screwed bodies . . . clamped or bolted covers . . . bodies of steel or special alloys and baskets of stainless steel, brass or monel . . . pressure ratings for all services. McAlear Strainers supply positive protection against grit and scale . . . cut pipe line repair costs . . . insure efficient operation.

IF IT'S McALEAR EQUIPPED
IT'S UNDER SAFE CONTROL

McALEAR
CHICAGO

Here's McAlear King Size Style 528 Strainer for hydraulic service . . . body, cast steel . . . 1200 lbs. working pressure . . . baskets, stainless steel . . . size, 24" . . . weight, 10,000 lbs.

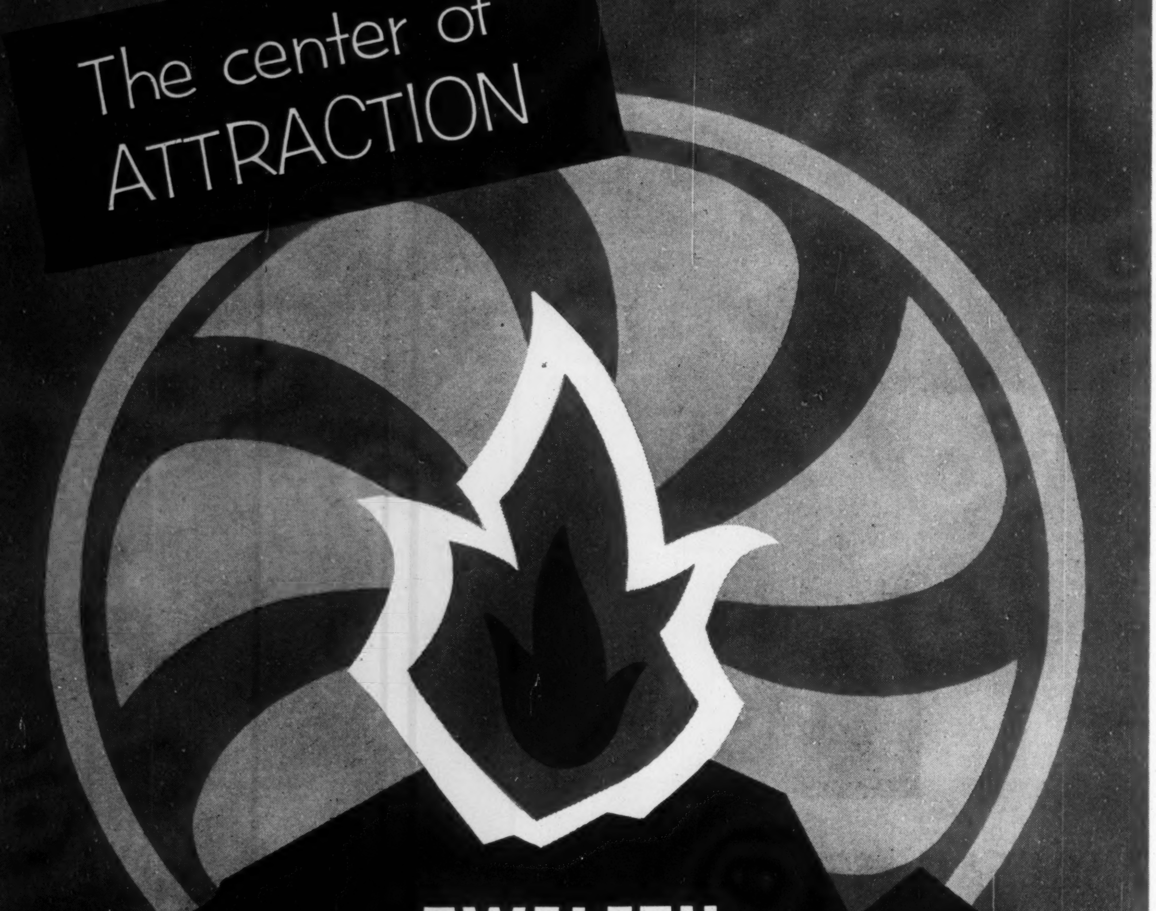


Style 530—flanged ends
Cast Iron: 1¼" to 10" inclusive
Cast Steel: 1½" to 10" inclusive

Style M530—Screwed Ends
With Mesh Basket
¼" to 4" sizes

McALEAR
PRESSURE · FLOW · LIQUID LEVEL · TEMPERATURE
controls
for STEAM, WATER, AIR, OIL-GAS

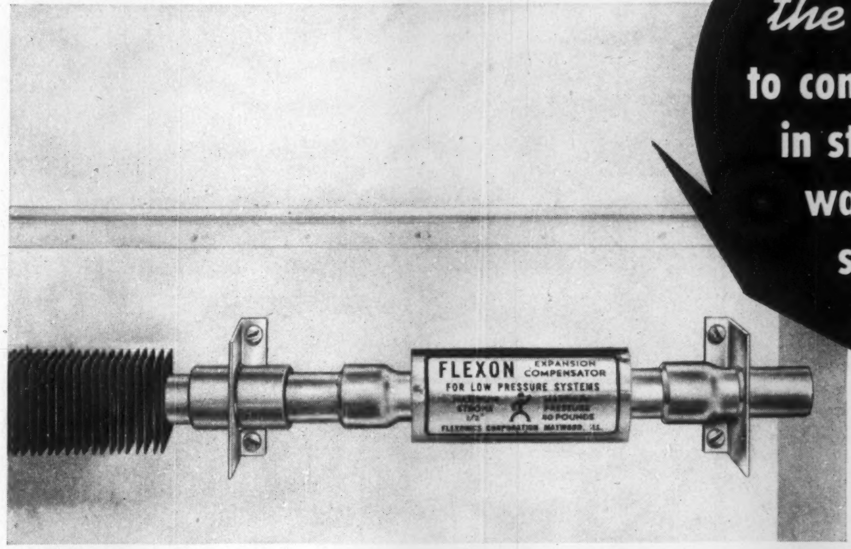
McALEAR MANUFACTURING COMPANY
1901-1919 South Western Avenue
Chicago 8, Illinois



TWELFTH
Air Conditioning
Exposition
INTERNATIONAL HEATING &
VENTILATING EXPOSITION
COMMERCIAL MUSEUM • PHILADELPHIA
JANUARY 24-28, 1955

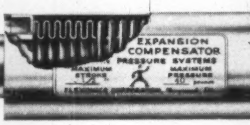
Under the auspices of the American Society of Heating and Ventilating Engineers
Write now for advance registration: International Exposition Co., 480 Lexington Ave., New York 17, N. Y.

Here's the right way
to control expansion in steam and hot water heating systems...


FLEXON EXPANSION COMPENSATOR
FOR LOW PRESSURE SYSTEMS
FLEXONICS CORPORATION MAYWOOD, ILL.

THE *New* FLEXON EXPANSION COMPENSATOR...

DESIGN DETAILS



The Flexon Expansion Compensator consists of a two ply phosphor bronze bellows with copper tube end connections (sizes ¾″ to 1¼″) enclosed in a floating protective shroud of brass. All joints are electronically sealed with silver solder for long leak-proof life. The 2″ size is especially guided and has standard threaded fittings. A single compensator will handle total piping motion up to ⅝″ (½″ in compression, ⅛″ in extension). Suitable for temperatures from —60° F. to 250° F. and for pressures up to 40 psig.

Control of thermal expansion in low pressure steam and hot water heating systems need not be a headache any longer. The new Flexon Expansion Compensator provides a practical, economical answer to the problem. Designed especially for finned type convectors, baseboard, radiator or heating supply or return lines, the Flexon Expansion Compensator is ideally suited for use in homes, office buildings, schools or any buildings where expansion in heating piping is a problem.

The Flexon Expansion Compensator is practical because it puts an end to leakage that often results from uncontrolled expansion and eliminates objectionable pipe creeping noises. It is economical because it is designed to outlast the building and requires no maintenance whatsoever. Just install it and forget it.

Flexon Expansion Compensators are made in ¾″, 1″, 1¼″ and 2″ sizes. Contact your local distributor for further information, or use the coupon below to get your copy of a descriptive bulletin.

Flexonics *Corporation*

Flexon identifies products of Flexonics Corporation that have served industry for over 52 years.

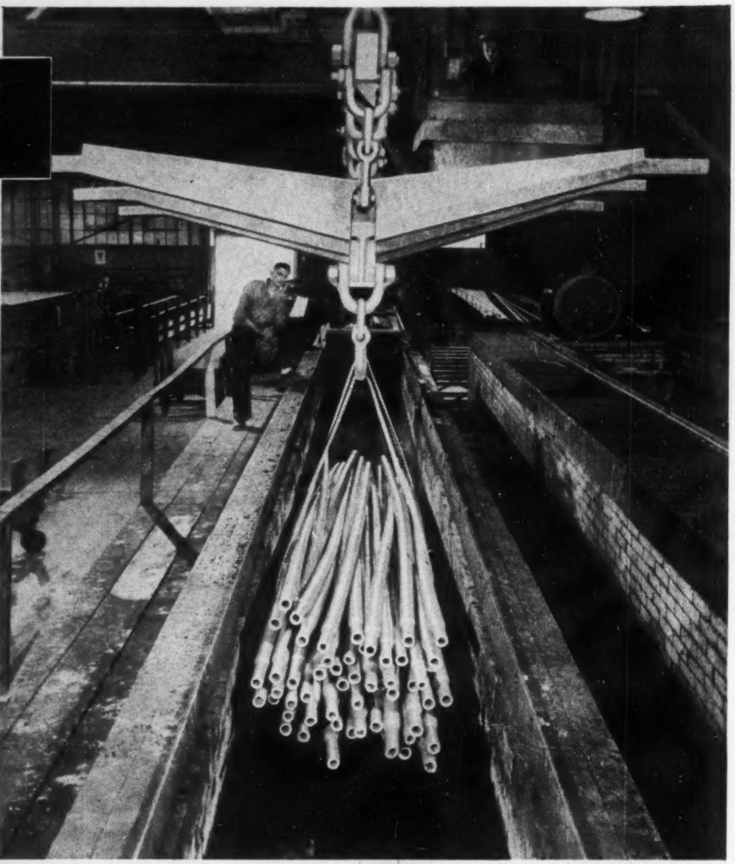
EXPANSION JOINT DIVISION
1391 S. Third Avenue
Maywood, Illinois

Flexonics Corporation
1391 S. Third Ave.
Maywood, Ill.

Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

Name ....
Company ....
Address ....
City .... Zone .... State ....
My Wholesaler is: ....

Industry wipes out corrosion with Firestone Exon Resins

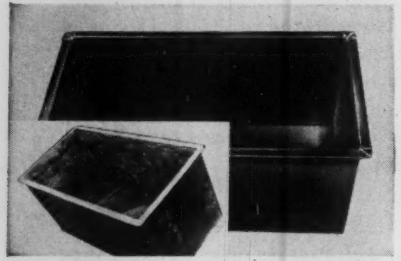


Installation by National Acid Proofing Co., Tinley Park, Ill.

LINED WITH VYFLEX L-10*

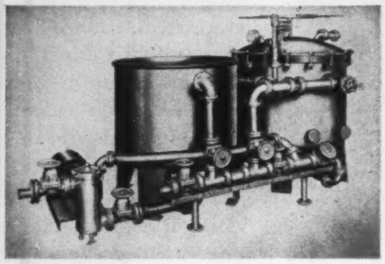
TANKS WIN EVERY BATTLE AGAINST CORROSION

Corrosion costs kept pyramiding at the Globe Steel Tubes Co., Milwaukee, Wisconsin. At temperatures of 80° to 90°, solutions of 20% nitric acid-hydrofluoric acid quickly ruined each type of costly lining tried in the 47-foot "pickling tank." After exhaustive tests of every available material, Globe engineers finally hit upon Vyflex L-10* made from Exon 900 series resins. This durable vinyl lining ended their corrosion problem. Installation was quick, simple and less costly than the linings previously used. Subsequent maintenance and replacement costs have been eliminated!

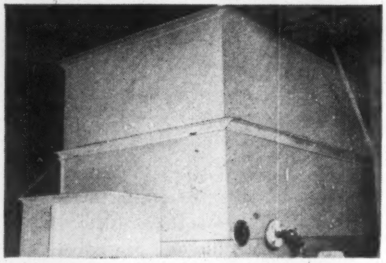


★ Corrosive chromic acid plating solutions destroyed in 6 months protective surface applied at the Tripp Plating Co., Buffalo. At 150° operating temperature, the acid has yet to affect tanks since they were lined with Vyflex L-10*.

Installation by Metal Cladding Inc., Buffalo, N.Y.



★ Standard 4200 G.P.H. chrome plating solution filter with Vyflex L-10* linings, made by Industrial Filter & Pump Mfg. Co., of Chicago. This leading filter manufacturer selected Vyflex L-10* linings as part of the original construction for this unit.



★ At Hoffmann-LaRoche Plant in Nutley, N. J., Vyflex L-10's* versatility permitted *on the spot* relining, without dismantling the huge 6' x 6' x 10' bleach tanks. Thus, installation costs and "down" time were greatly reduced.

Installation by La Favorite Linings, Inc., Hawthorne, N. J.

The simple fact is: you can stop corrosion. The tank liners shown above are based on only one of the many Exon resins developed by Firestone engineers to answer corrosion problems.

Exon polyvinyl chloride resins are the bases for a wide variety of corrosion controlling materials. In the form of lightweight structural rigids, linings or coatings, these versatile P.V.C. materials have a wide range of properties, providing the answer to your specific corrosion problem.

For details that will interest you in particular, call or write:

Chemical Sales Division

FIRESTONE PLASTICS COMPANY, DEPT. 23D, POTTSTOWN, PENNSYLVANIA
A DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

*Vyflex L-10, made from EXON 900 series resins is a product of Kaykor Industries, Inc. Division of Kaye-Tex Mfg. Corp. Yardville, New Jersey.

Firestone EXON

NOTE: Firestone supplies the resin only, does not manufacture the end product.

A NEW DEVELOPMENT
OF
ARMSTRONG RESEARCH

PLASTICORK . . . *a granulated cork-and-rubber insulation that can be molded to any cold line fittings*

Now you can insulate irregular fittings without having to cut standard molded covers on the job or wait while special ones are factory made. With Armstrong's Plasticork®, the workman just shapes the covers as he goes, speedily and efficiently.

Plasticork is a granulated cork-and-rubber material made in sheet form. In covering a fitting, small chunks are pulled from a sheet and packed into all voids. Full insulation thickness is then built up with pieces or with full sheets, depending on the type of fitting. When finished, the fitting compares favorably in appearance and efficiency with a regular molded cover.

Plasticork is easy to warehouse. It can be stored indefinitely without loss of plasticity. It can also be removed from a fitting and used again without loss of its original insulating efficiency or workability.

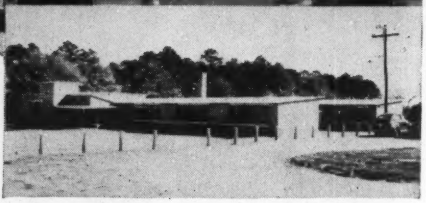
Armstrong's continuing research in industrial insulations is helping to solve many high- and low-temperature insulation problems. For complete information on Plasticork, Armstrong's other industrial insulations, and Armstrong's Complete Contract Service, call your nearest Armstrong office or write Armstrong Cork Company, 204 Stratton St., Lancaster, Pennsylvania.

Armstrong's Insulcolor, a new plastic finish for insulated surfaces, is being applied to this Plasticork insulated fitting. Insulcolor can be used indoors or out, comes in a choice of seven colors and white.

ARMSTRONG'S INDUSTRIAL INSULATIONS

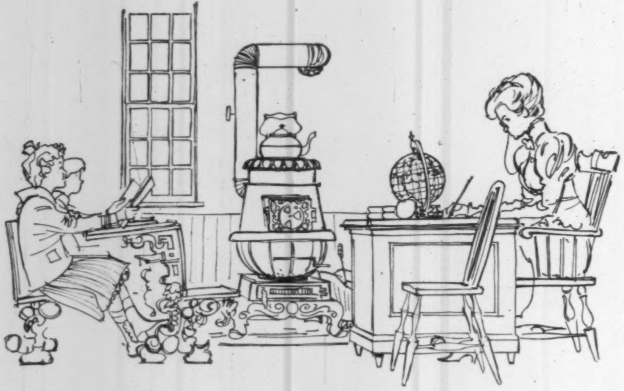
Congratulations to Macon, Georgia on its radiant heated Junior High School for Girls

The little Red Schoolhouse



Albany, Georgia keeps pace with radiant heated Isabella Heights School

...aint what she used to be!

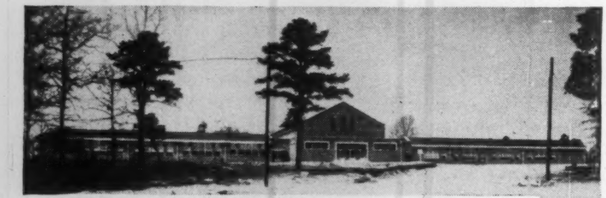


Memories of the little red schoolhouse and the heart-tugging refrain "school days, school days, good old golden rule days" are fine . . . sentimentally. Practically, we Americans have too much concern for the health and welfare of our children to really want to return to the era of the wood stove and kerosene lamp. The hickory stick . . . maybe . . . but not the others!

We take pride in the finest school buildings in the world because we know that the education of our children is the most *important* thing in the world . . . basic to American progress. So we're not "soft," just realistic, in providing the best light, heat, sanitation and recreational facilities possible. Healthy children learn more, faster.

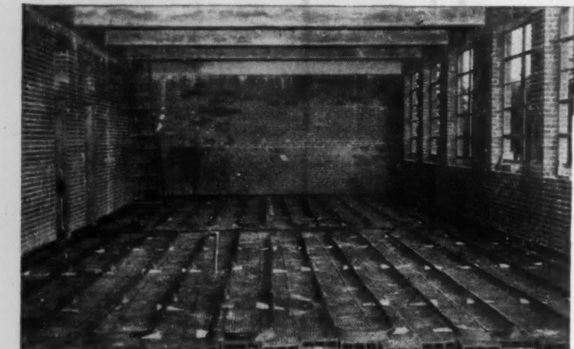
All over the country new schools are incorporating radiant heating because its gentle, all-permeating, sun-like warmth . . . without hot or cold spots, drafts, or dust laden currents . . . provides the most healthful school heating known. Concealed heat sources and controls resist vandalism, promote safety, save valuable floor and wall space and improve classroom appearance. Auditoriums and gymnasiums (even swimming pools!) derive particular benefit.

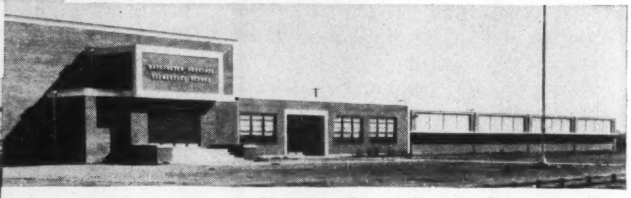
Steel pipe is, of course, first choice for radiant heating as it is for conventional heating . . . proved in more than 60 years of service in steam and hot water systems. In fact steel pipe is the most widely used pipe in the world, for heating, plumbing, snow melting, fire sprinkler systems and the transmission of power, steam and air.



Beautiful Lakeview School, Vass, N. Carolina will be comfortable, too, with radiant heating

Typical installation in modern schoolroom





Washington - Douglass Elementary School, Jackson, Tenn., looks as modern as its radiant heating

Send for free 48 page color booklet "Radiant Panel Heating with Steel Pipe" and 32 page companion booklet "Steel Pipe Snow Melting and Ice Removal Systems."

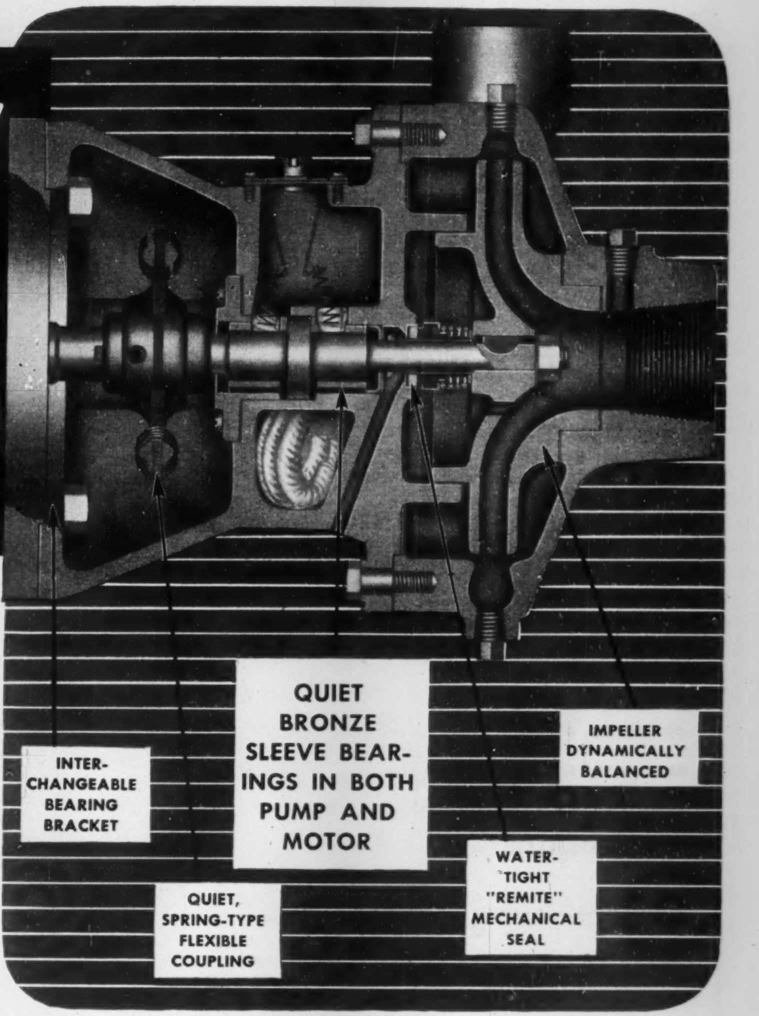
Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N.Y.

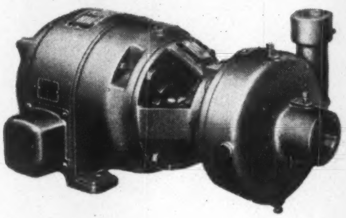
Steel Pipe
is First Choice

QUIETER!

GET RID OF NOISE TROUBLE IN YOUR COOLING INSTALLATIONS ...NEXT TIME BUY A

B & G SERIES 1522 CENTRIFUGAL PUMP

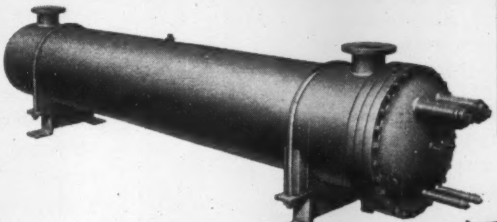

INTER-CHANGEABLE BEARING BRACKET
QUIET, SPRING-TYPE FLEXIBLE COUPLING
QUIET BRONZE SLEEVE BEARINGS IN BOTH PUMP AND MOTOR
WATER-TIGHT "REMITE" MECHANICAL SEAL
IMPELLER DYNAMICALLY BALANCED



This pump is *really quiet*...because *both pump and motor* are equipped with long bronze sleeve bearings...and because of the noise-dampening flexible spring-type coupler.

The 1522 offers an outstanding array of other features for dependable, low-cost operation. The "Remite" Mechanical Seal, for example, ends leakage troubles. It's self-lubricating—*harder than glass*—wear-proof. The impeller is dynamically balanced for smooth, vibration-less operation...the entire bearing bracket assembly, including shaft and sleeve bearing, is interchangeable. Servicing is simple—the 1522 separates into three parts.

All these *plus* values cost no more—the B & G 1522 Pump is *competitively priced!* It is available as an all-iron, bronze-fitted, all-bronze or a stainless steel unit, with capacities to 150 GPM, heads to 115 ft. Send for Catalog.



Get the facts now on the latest in refrigeration and air conditioning equipment.

B & G precision-built Evaporators and Condensers offer time-tested design—rugged construction—scrupulous workmanship—all combined to provide top performance over a long service life. These units are built to ASME Code U-69 regulations and are certified by Hartford Steam Boiler and Inspection Service. Send for catalogs with new simplified engineering and selection data.

A complete line of refrigeration and air conditioning components . . . Centrifugal Pumps, Evaporators, Condensers, Liquid Receivers, and Heat Exchangers.

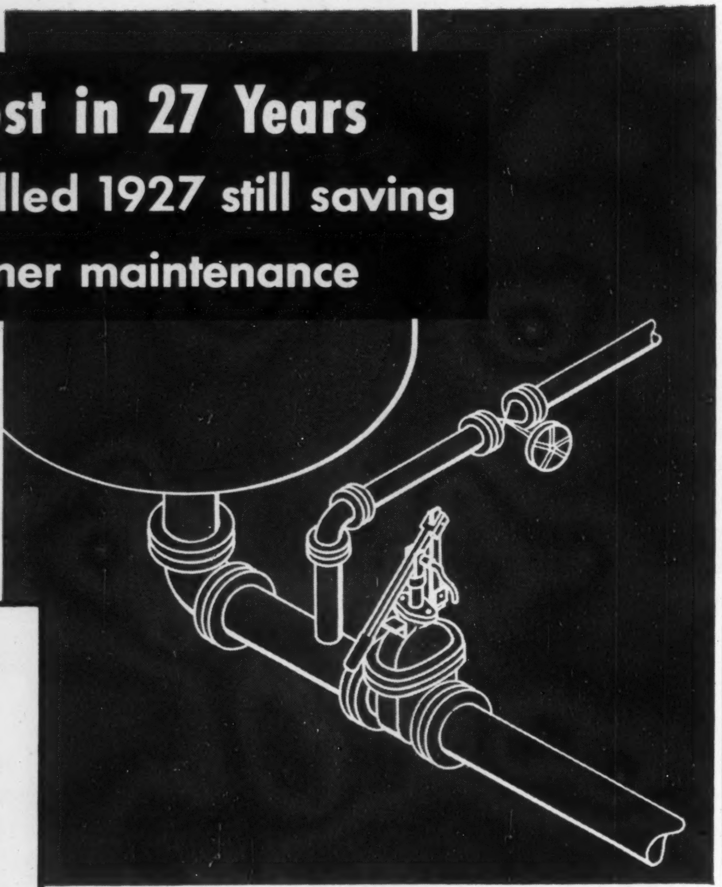
BELL & GOSSETT COMPANY

Dept. RDP-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

No Repair Cost in 27 Years

Quality Valve installed 1927 still saving on water softener maintenance



The Installation

At Phoenix Manufacturing Company, Joliet, Illinois, steel and rubber products plant. Original installation of 6-inch Crane quick-opening iron gate valve on flush-out line from water treating tank in soda ash-lime softener system.

Valve Service Ratings

SUITABILITY: Never failed

FEATURES: Rugged, easy-to-service design

MAINTENANCE COST: Zero

SERVICE LIFE: 27 years—still on job

OPERATING RESULTS: Lower cost water treating

AVAILABILITY: Crane catalog item—Current No. 471

The Valve

Further improved inside and out in many ways since 1927, modern Crane Iron Body Gate Valves keep making these performance records. Quick-opening design No. 471 shown, is but one member of this big, complete in size and pattern family. Includes OS&Y and inside screw valves; all iron and brass trim; screwed, flanged, and hub ends. Whatever your need, Crane lists it in your No. 53 catalog—or ask your Crane Representative.

CRANE
125 S
200 WOG

The Case History

With each operation—2 or 3 times daily—more than 27 years—this Crane valve has demonstrated the thrift of a quality-buying policy.

Not once has it failed to open wide quickly, smoothly, and again to seat tightly in this customarily rough-on-valves service.

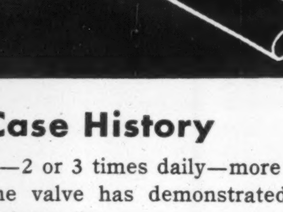
Not once has this valve undergone any repairs or maintenance. The only attention was periodic routine servicing with occasional clean-up. Still the customer reports: "good and satisfactory service."

Today, more than ever, quality buying is your best guard against high maintenance cost. And today, as always, better quality in valves means Crane valves.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

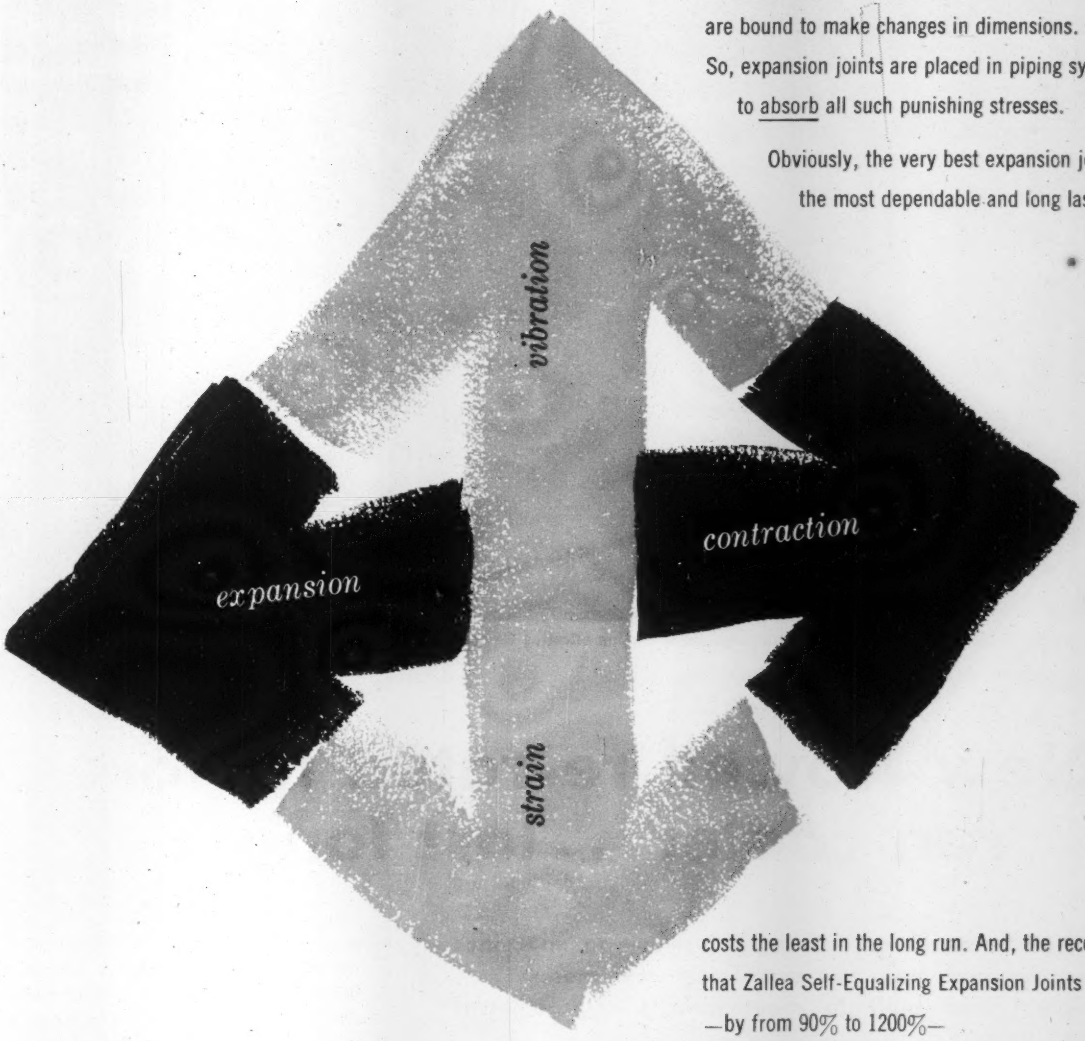
CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas



VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Piping in power, petroleum and processing plants
is designed to move.
After all, service variations
are bound to make changes in dimensions.
So, expansion joints are placed in piping systems . . .
to absorb all such punishing stresses.

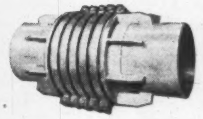
Obviously, the very best expansion joint,
the most dependable and long lasting,



costs the least in the long run. And, the records show
that Zallea Self-Equalizing Expansion Joints outlast
—by from 90% to 1200%—
any other self-equalizing
or other type of packless joint.

So, that's why you should insist
that the Zallea name be on
the next expansion joints you buy. To do so protects
both your piping . . . and your pocket book.

Zallea already has, or will make, expansion joints for every service. For information on standard types, ask for Bulletin 351. For consultation on special problems, ask to have a representative call.



Zallea expansion joints

ZALLEA BROTHERS, 816 LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints

Let this unique illustration convey to you the remarkable cooling effect of Howell's new internal ventilation system in Series 100 Motors.

New Howell re-rated motors run cooler... last longer

Your motor needs have changed just as your machines have changed. Here are *completely* new motors . . . designed and built to meet *today's* requirements!

Now! Howell brings you everything you want in a re-rated motor: smaller size and lighter weight . . . plus *better cooling* for less maintenance and longer life.

Howell Series 100 re-rated motors feature a new internal ventilation system that provides 50% more contact between cooling air and active lamination materials. Temperature ratings are easily maintained; overload capacity is increased.

Many New Features

Series 100 Motors offer many other advantages: *They take up less space* – up to 30% less in some sizes; both open and totally enclosed fan-cooled motors have same diameters. *They perform better* – Howell uses dependable copper rotors for higher conductivity, greater flexibility; new Mylar* slot insulation is thinner (more space for copper windings), yet eight times stronger. *They last longer* – better cooling, double-shielded bearings and super tough steel frames and feet, with cast iron endplates, insure extra years of trouble-free performance. *They fit your special needs* – Howell provides rotors in three diameters for each frame size; corrosion-resistant materials and fittings are available to meet your specific industry problems.

Before you buy any re-rated motor, compare Howell Series 100 Motors for modern design, outstanding performance, and engineered precision. Howell will continue to make a complete line of regular and special motors – we have in our files more than 20,000 electrical design specifications! Let us serve you. Call your Howell man today.

*DuPont trade mark

HOWELL Red Band MOTORS

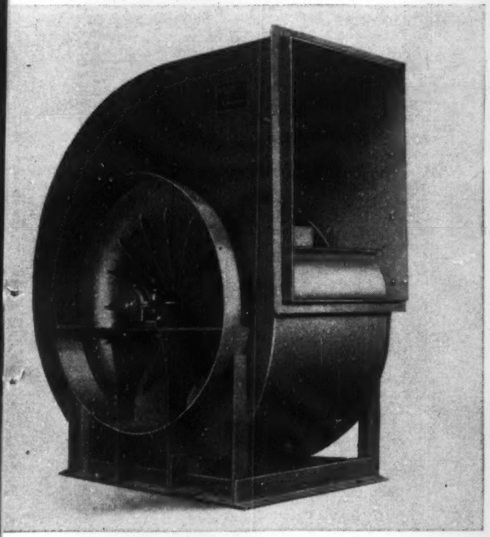
HOWELL MOTORS

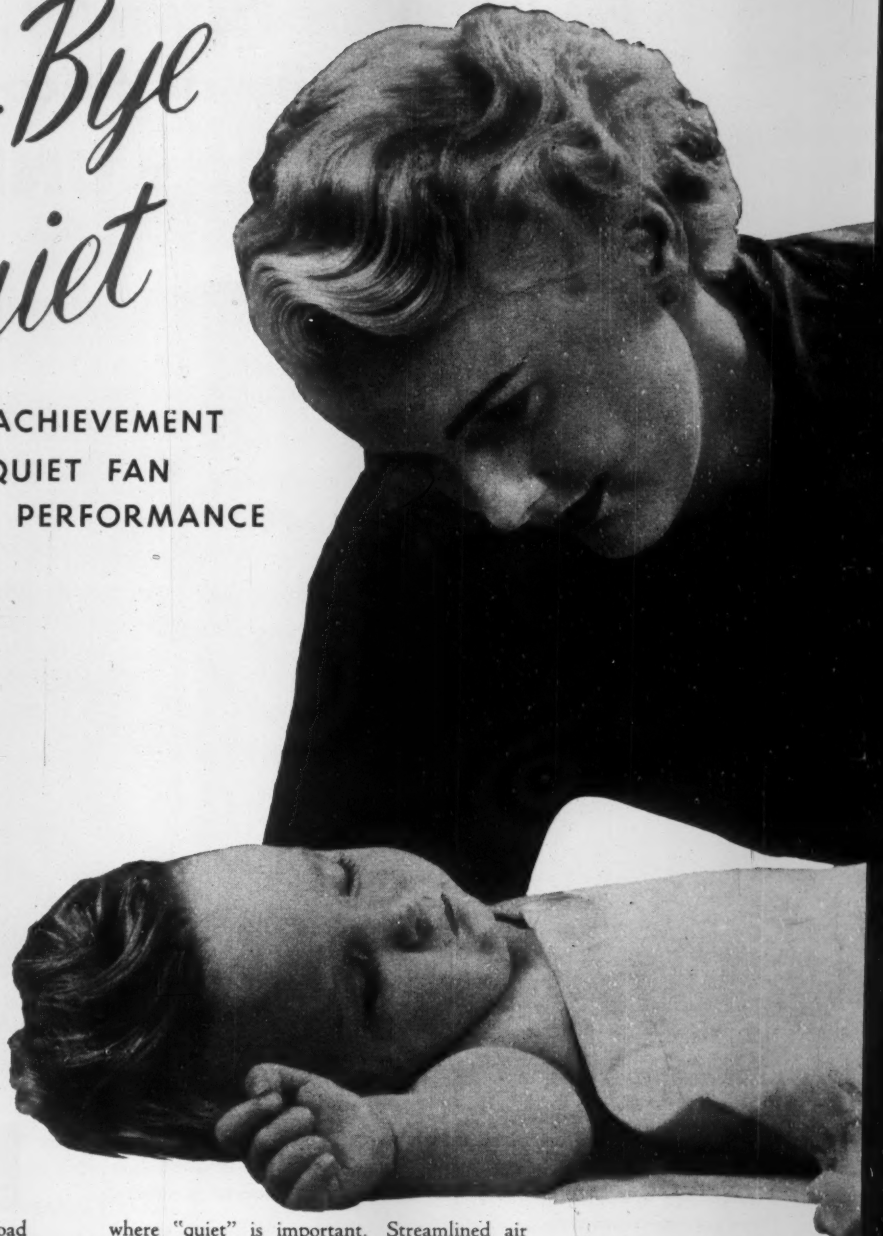
Howell Electric Motors Company, Howell, Michigan

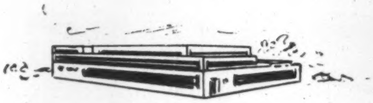
MOTORS FOR INDUSTRY SINCE 1915

"Hush-a-Bye" Quiet

A NEW ACHIEVEMENT IN QUIET FAN PERFORMANCE







The new "Buffalo" Type "BL" Limit-Load Fan with the "Q" Factor* brings in a new era of low-decibel performance which will have a profound effect on ventilation in plants, hospitals, hotels, office buildings, schools, stores and auditoriums . . . in fact, in any building where "quiet" is important. Streamlined air movement through "Buffalo's" fixed inlet vanes and new backward curved blade wheel results in high efficiency, superb smoothness and quietness. Why not see the reasons for this, in new Bulletin F-100. Your copy mailed on request.

** The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

171 MORTIMER ST. BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

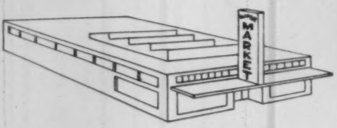
"Buffalo"

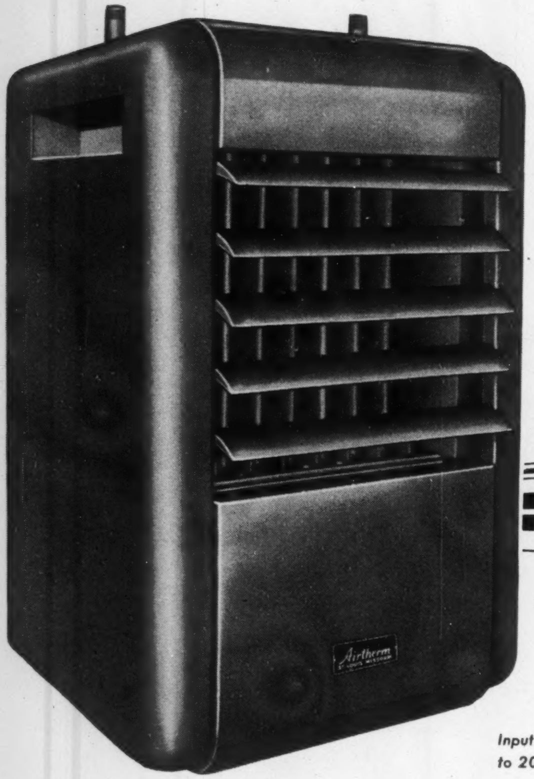
VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

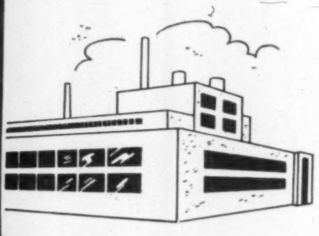
Put Heat Where You Need It . . .

Easily and Economically

with *Airtherm* GAS UNIT HEATERS





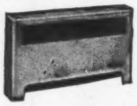


Input 25,000 BTU to 200,000 BTU

These attractive, self-contained units now give you new freedom and flexibility in laying out heating systems. For quiet, clean and completely automatic heat, they can be installed just about anywhere you can run a gas pipe.

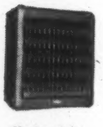
In addition to general heating in commercial, industrial and institutional buildings of all kinds, you'll find Airtherm Gas Unit Heaters useful for many special purposes, such as drying, blanketing doorways, etc.

For complete data on gas unit heater installation with all types of gases, write for your FREE copy of Catalog 500.

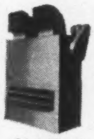


Convectors

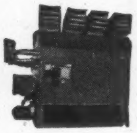
Vertical Steam Unit Heaters



Horizontal Steam Unit Heaters



Centrifugal Fan Type Unit Heaters

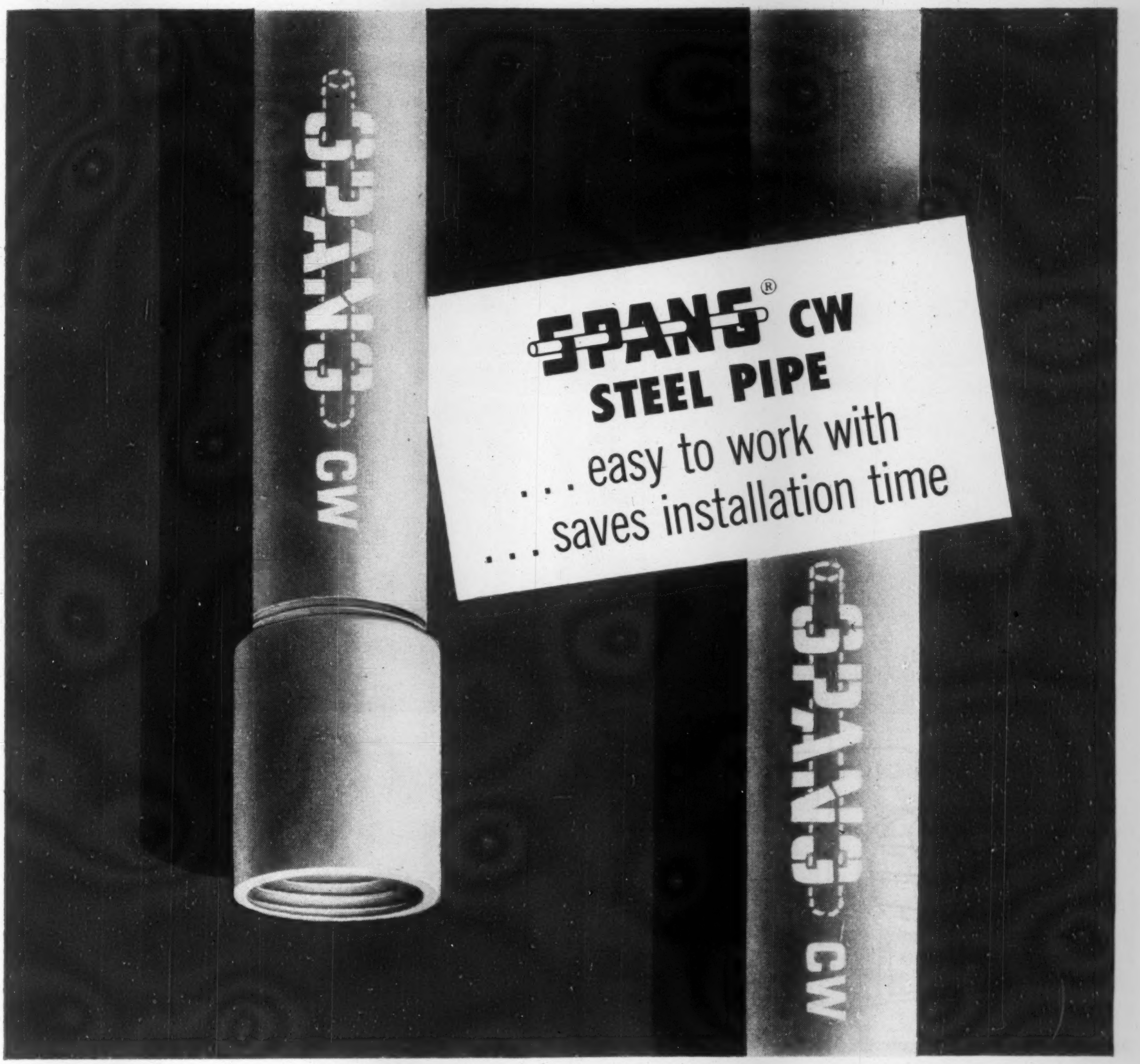


Direct Fired Space Heaters

Gas Fired Unit Heaters

FOR HEATING SATISFACTION . . . THINK FIRST OF

Airtherm MANUFACTURING COMPANY
711 South Spring Avenue • St. Louis 10, Missouri



The reason? SPANG CW Steel Pipe is uniform in every respect . . . a result of quality-controlled manufacturing.

—SPANG CW has strong, uniform welds

During the forming and welding of SPANG Pipe, automatic heat control eliminates temperature deviations. This produces highest quality welds and assures uniform pipe strength through the entire length of the pipe.

—SPANG CW has uniform diameter

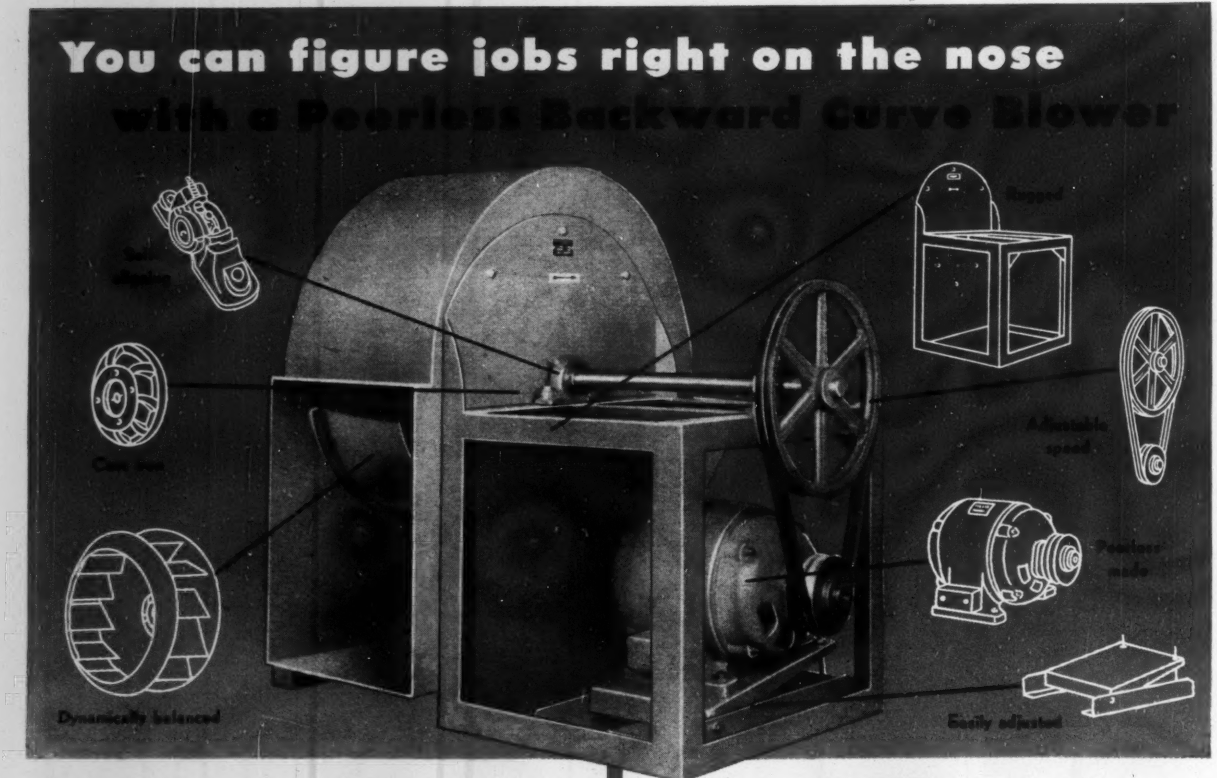
Finished pipe is carefully sized and straightened to assure uniformity. Careful testing and inspection eliminates any CW Pipe that does not come up to SPANG's high standard.

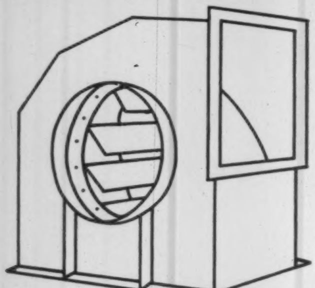
The result? SPANG CW Steel Pipe is easy to work with . . . easy to cut, bend, thread and weld. It saves you time on the job . . . gives you faster installations . . . saves you money, too!

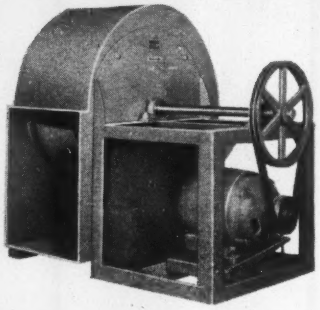
SPANG CW Steel Pipe is tops for plumbing, heating, air conditioning, radiant heating and snow-melting systems. Call your nearest SPANG Distributor for complete information on SPANG CW Steel Pipe. Try it on your next job!

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Pittsburgh 30, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

You can figure jobs right on the nose with a Peerless Backward Curve Blower







. . . HERE'S WHAT YOU LOSE WITH AN UNKNOWN BLOWER

When parts are not engineered or built by the blower manufacturer, they are purchased all over the country. Efficiency ratings may suffer and you may be forced to protect the job with a larger, more expensive blower than the job requires. Thus, your bids may be higher and you may have fewer jobs and smaller profits. You may not get factory help on engineering problems.

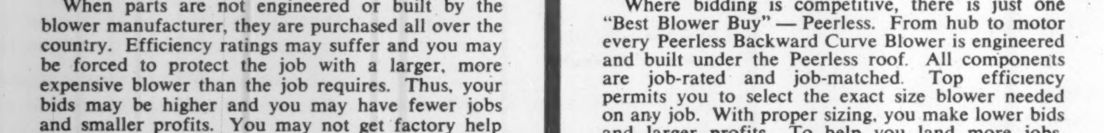
Specify and install the backward curve blower that eliminates doubts — Peerless.

. . . HERE'S WHAT YOU GAIN WITH A PEERLESS BLOWER

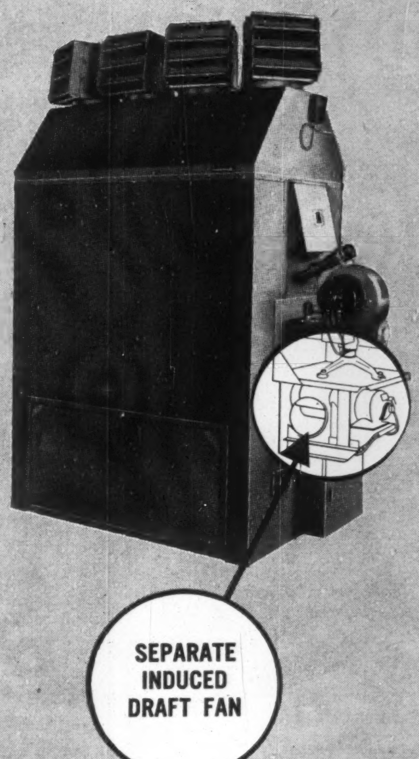
Where bidding is competitive, there is just one "Best Blower Buy" — Peerless. From hub to motor every Peerless Backward Curve Blower is engineered and built under the Peerless roof. All components are job-rated and job-matched. Top efficiency permits you to select the exact size blower needed on any job. With proper sizing, you make lower bids and larger profits. To help you land more jobs, Peerless gives you any needed engineering help. Write, wire, or phone Peerless when you're bidding the next job.

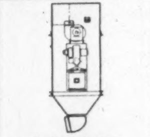
FAN AND BLOWER DIVISION
THE PEERLESS ELECTRIC COMPANY
1409 W. MARKET ST. • WARREN, OHIO

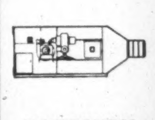
Peerless Electric

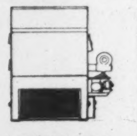


SEPARATE DRAFT FAN




INVERTED


HORIZONTAL


DUCT TOP

Olson Heaters are available in many models and wide variation of applications of make up air, drying, high temperature and process work. Capacities range from 300,000 to 7,500,000 B.T.U. per hour.

SEPARATE DRAFT FAN —

An exclusive Olson feature, not to be found on ordinary heaters, is the separate induced draft fan. It operates independently from the main fan motor and is activated by separate thermostatic controls. When the thermostat calls for heat, the draft fan starts. — Only when the temperature in bonnet reaches a predetermined point, the main blowing fans start, thereby delivering warm air immediately, avoiding cold blasts with every start. This feature is especially appreciated by people working in the area.

A bonus economy is gained when burner and draft fan stop. The main fans continue to operate, distributing all radiating heat until it is dissipated.

CONTROL PANEL BOX —

Dust tight, damp proof — located within easy sight and reach of all adjustments. Operates on 110 volts from transformer in panel box.

RUGGED CONSTRUCTION

Rigid base, free from vibration, low fan speed, oversize drive, heavy shaft, large self-aligning ball bearings, heavy outside casing with radiation shield and ample relief and access doors.

ALL POPULAR PARTS

All accessories on Olson Heaters are of the best name and quality known to heating engineers. They are standard products of nationally known manufacturers. Replacements are available anywhere.

WRITE FOR BULLETIN AIA — Detailed, Illustrated

Olson

ARTHUR A. OLSON & CO., CANFIELD, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES

HEATERS FOR GAS, OIL, COAL OR DUAL GAS AND OIL.

*FIRST LINE *Extended-Surface* HEAT EXCHANGERS

ASK THE AEROFIN MAN

Specify Aerofin and you specify high efficiency, long service life and low maintenance and service costs.

Take advantage of Aerofin's unequalled experience, production facilities, and materials-testing and design research—of Aerofin's complete engineering service at the plant and in the field.

Ask the Aerofin man.

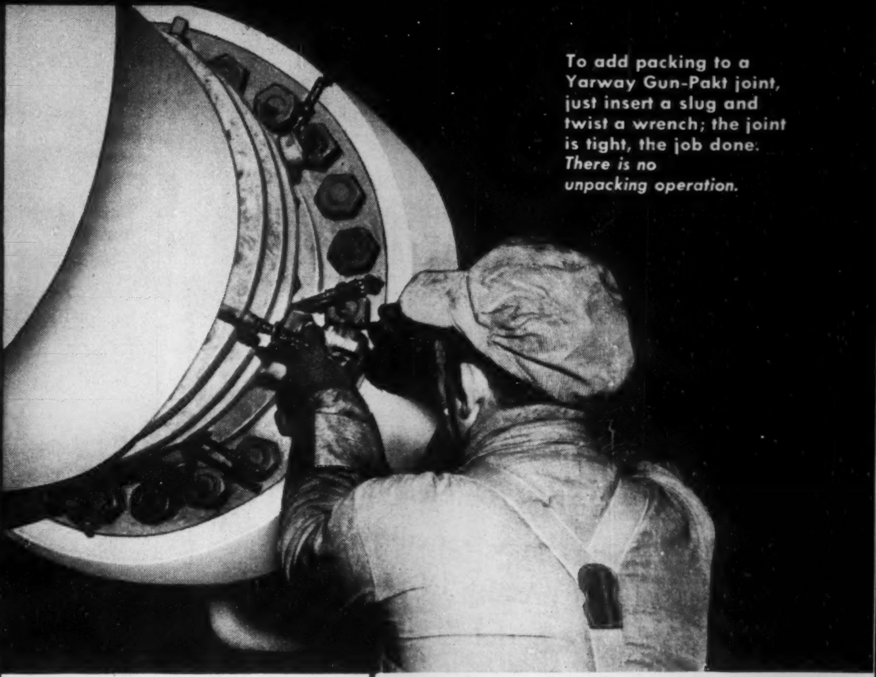
* Aerofin makes extended heat surface exclusively — not as a by-product, not as a side-line. Sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION

101 Greenway Avenue, Syracuse 1, N. Y.

STARTLING NEW FACTS ON EXPANSION JOINT MAINTENANCE

It may cost less than you think to service expansion joints. Look at these records from three typical users of Yarway Gun-Pakt Expansion Joints:



To add packing to a Yarway Gun-Pakt joint, just insert a slug and twist a wrench; the joint is tight, the job done. *There is no unpacking operation.*

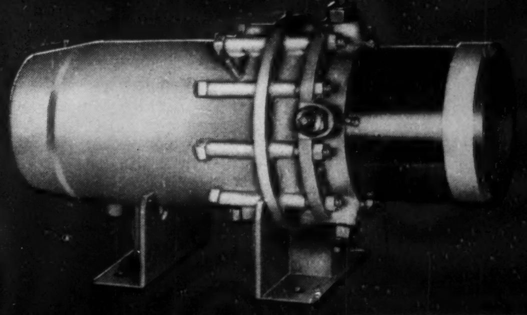
	YARWAY GUN-PAKT JOINTS	CONVENTIONAL GLAND-PACKED JOINTS
STATE UNIVERSITY*	Required addition of only 3 slugs (45 cents) of packing in 5 years. Lubrication only once every 6 months. Total labor time of only 2 manhours in 5 years.	Same lubrication as Gun-Pakt, *plus* gland tightening, *plus* complete overhaul with shutdown for unpacking and repacking every 3 to 4 years. Time for overhaul—25 manhours per joint!
MID-WEST AIRFIELD*	Only maintenance was lubrication and addition of 2 slugs (30 cents) of packing per year. Total labor ¼ manhour per joint per year.	Lubrication and gland tightening required 8 manhours per joint per year—plus complete unpacking and overhaul every 2 to 3 years. Time required for overhaul—20 manhours per joint.
"BIG TEN" UNIVERSITY*	Lubrication only once every 2 months, with packing added as needed. Total labor time charged, 1 manhour per joint per year.	General maintenance requires 6 manhours per joint per year. Complete overhaul required every 2 to 3 years with unpacking and repacking—24 manhours per joint.

**Names on request.*

To get the full facts on Yarway Gun-Pakt Expansion Joints, and how they can save you maintenance money, write for Yarway Bulletin EJ-1913.

YARNALL-WARING COMPANY
107 Mermaid Ave., Philadelphia 18, Pa.

YARWAY



Yarway single-end, welding type Gun-Pakt joint for pressures to 300 psi, heavier design for higher pressures. Single-end traverses up to 12 inches; double-end up to 24 inches.

gun-pakt expansion joints

The modern way is the WeldELL® way

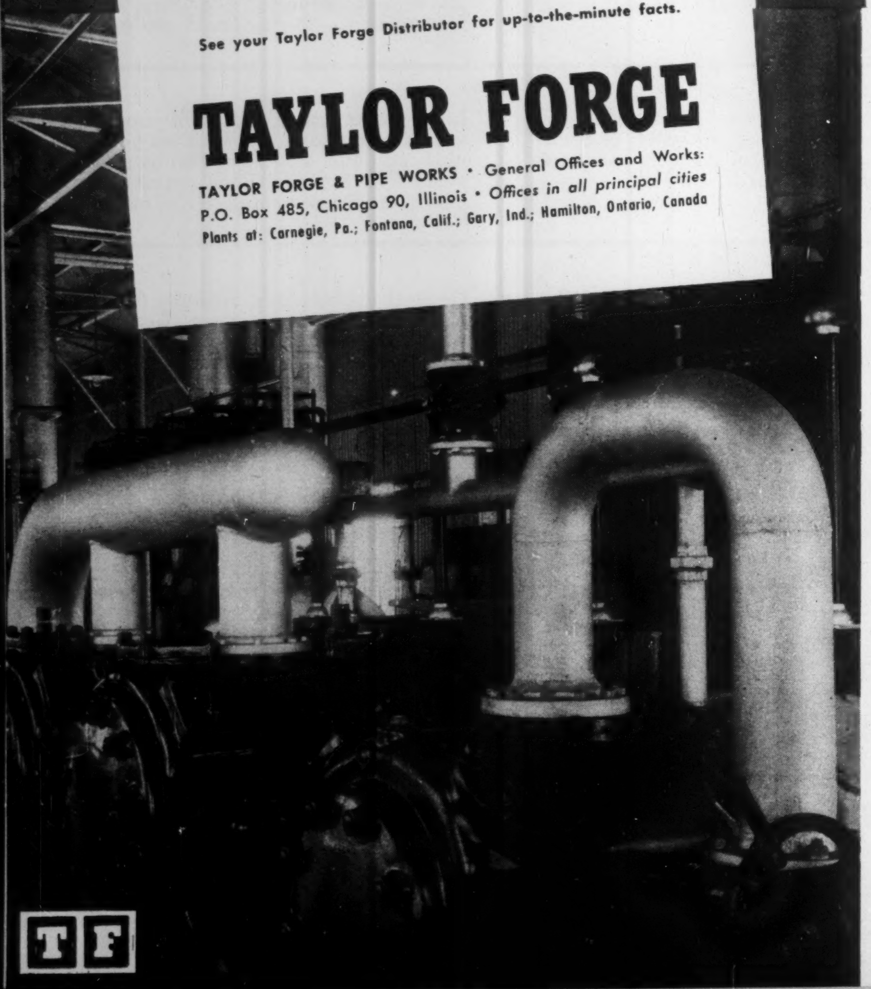
Naturally the organization that developed the first complete line of welding fittings has remained first...in design...in breadth of types, weights, sizes and materials.

That is why those who have followed the development of the WeldELL line, usually refuse to consider any other type of welding fittings.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works:
P.O. Box 485, Chicago 90, Illinois • *Offices in all principal cities*
Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada



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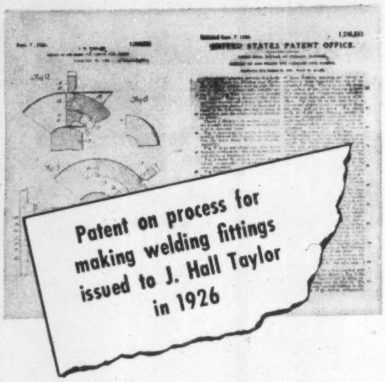

UNITED STATES PATENT OFFICE.

Patent on process for making welding fittings issued to J. Hall Taylor in 1926

The formula was written in 1926—

The invention of oxyacetylene and electric arc welding touched off the greatest single advance in modern piping practice—pipe welding.

The old way—the screwed fittings and heavy flanged fittings—put up a brave fight, but the handwriting was on the wall! For all important piping the old method was through.

Proof that Taylor Forge had foreseen this clear back in 1926 is shown above. Significantly enough, the process covered by this patent is still employed to give WeldELLS certain advantages not found in any other welding fittings.

But Taylor Forge experience had suggested careful procedure — had foreseen that pipe welding could not advance beyond its crude, torch-happy stage until *all* necessary fittings were provided to make *complete* welded systems.

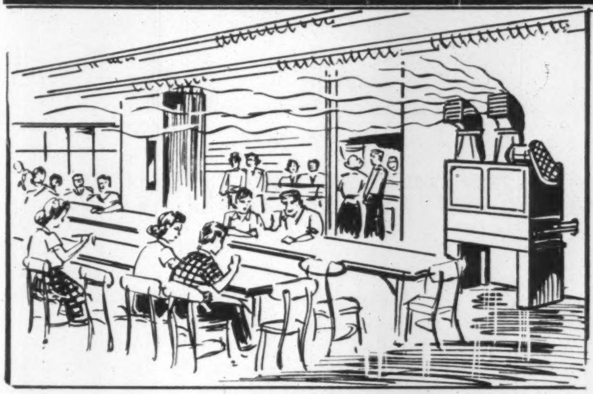
It took a number of years to do this job with Taylor Forge thoroughness, but in 1931 the announcement was made of the first complete line of seamless butt welding fittings — the first line to include not only elbows and return bends, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, caps, and the all-important (and then revolutionary) welding neck flanges.

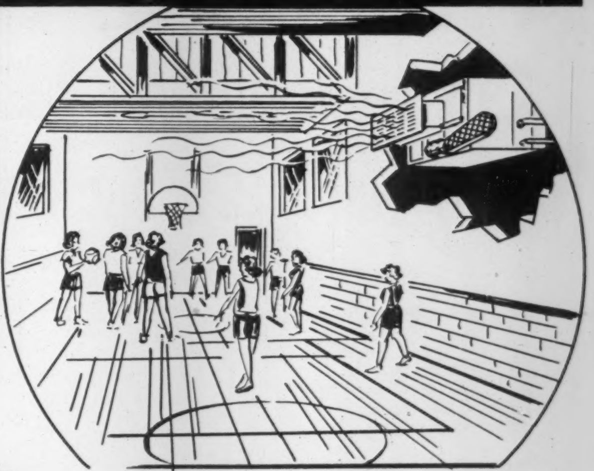
Out of 31 years of designed piping experience had come the greatest contribution to piping permanence.

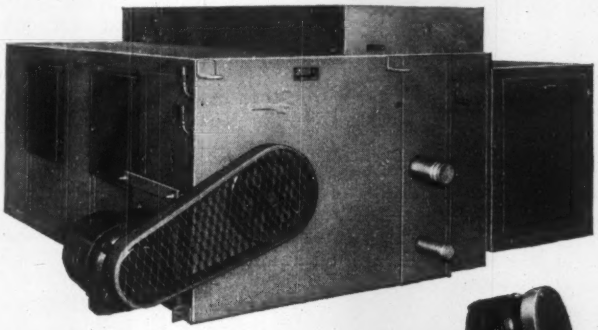
An episode in the story of Taylor Forge leadership in designed piping

KENNARD *Engineered*

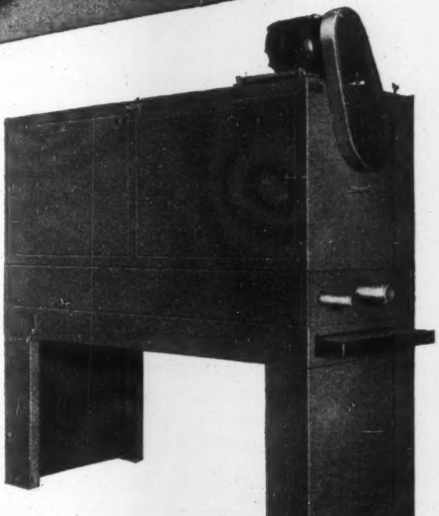
HEATING AND VENTILATING BLOWER UNITS







Wall or Ceiling Unit



Floor Unit

for SCHOOL...

AUDITORIUMS • CAFETERIAS • GYMNASIUMS
MANUAL TRAINING ROOMS
Models for Factories • Offices • Stores

Floor, Wall or Ceiling Arrangements, these units can be furnished with tempering or heating coils or combination of both for use with hot water or steam and the accessories for controlling, filtering and directing air flow.

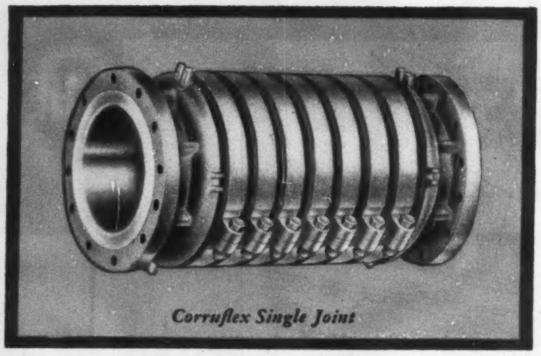
There is a Kennard H & V Unit that will fit your requirement of heating and filtering recirculated air, fresh air, a mixture of both or for ventilation only.

TYPICAL CAPACITIES

Unit No.	CFM at 800 FPM Coil Face Velocity	CFM at 500 FPM Coil Face Velocity	Maximum BTU Capacity 2 Row Coil
107	864	540	59,700
108	1,264	790	87,300
110	1,832	1,145	126,800
111	2,896	1,810	199,800
210	4,000	2,500	276,700
211	5,696	3,560	392,900
213	6,880	4,300	475,500
215	8,936	5,585	616,700
216	10,336	6,460	713,700
218	12,680	7,925	875,100
220	15,000	9,375	1,035,500
223	19,800	12,375	1,366,900
226	28,800	18,000	1,988,400

Write for Bulletin HV-1A

KENNARD CORPORATION
1817 HANLEY RD. • ST. LOUIS 17, MO.



Corruflex Single Joint

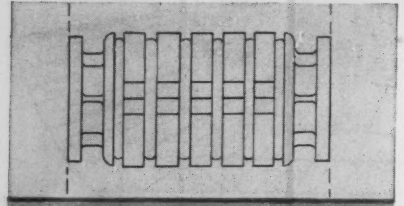
INSTALL...
AND THEN FORGET
Corruflex PACKLESS EXPANSION JOINTS

Why worry about maintenance in pipe lines when you don't have to? Install ADSCO Corruflex Expansion Joints... they are packless and require no maintenance. Put 'em in the line and forget 'em.

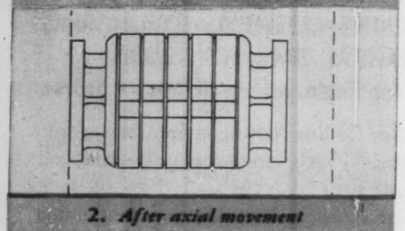
In ADSCO's *complete* Corruflex line there are many joints for many purposes: Swing, Hinge, Tie-Rod, Universal, Internally-Guided, Anti-Compression, Balanced, Gimbal, etc. But the leader of the Corruflex line.. the joint from which all others are derived...is the Basic Single Joint shown on this page. Here is a dependable workhorse which will solve many pipe expansion problems. Problems *it* can't solve *can* be solved by other Corruflex Joints.

Drawings 1 & 2 at left show accordion-like movement as the Basic Single Joint opens and closes to absorb axial movement. In Drawings 3 & 4, note that maximum lateral deflection and maximum angular rotation are obtained when joint is in median position. ADSCO can supply complete tabular data on the maximum amount of allowable lateral and angular movement either side of center line. Under certain conditions, such as the addition of extra corrugations, the Basic Single Joint can be used to absorb combined axial and lateral or combined axial and angular motions.

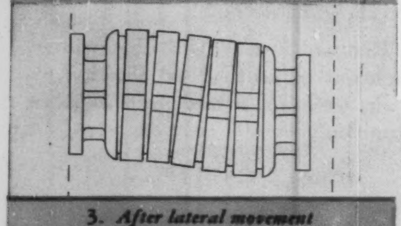
For assistance in laying out piping systems, a cordial invitation is extended to you to consult ADSCO's engineering staff. Phone your ADSCO representative about this service or write the factory direct.



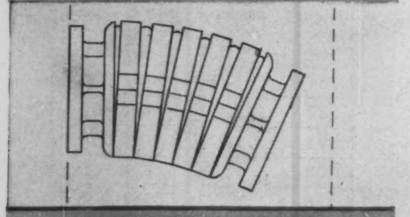
1. *Before movement of any kind*



2. *After axial movement*



3. *After lateral movement*

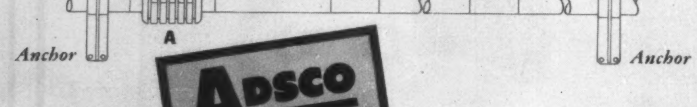


4. *After angular movement*

A. *Straight axial motion... basic single joint*

B. *Combined axial and angular motion . . . two single joints with tie rods*

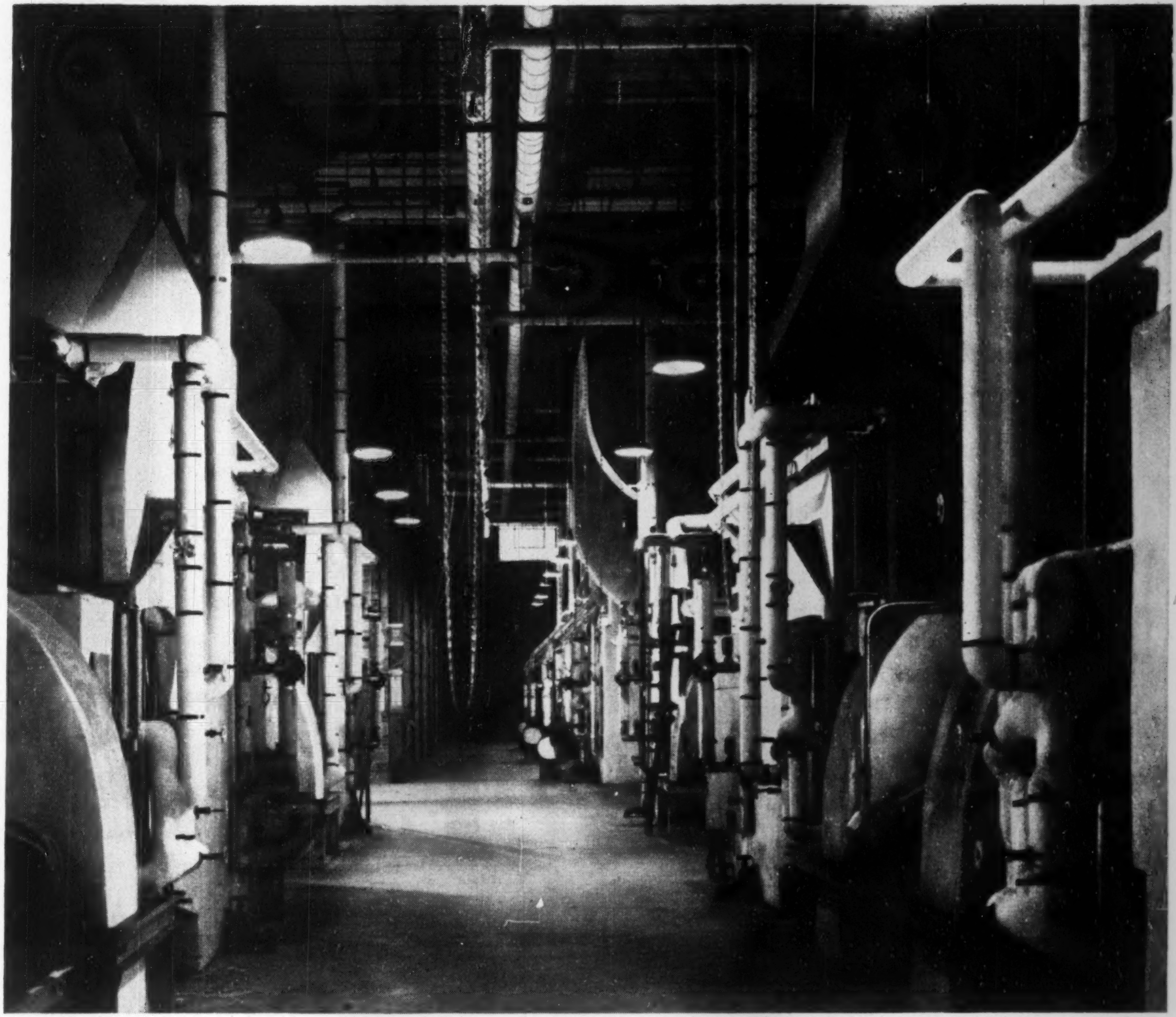
C. *Lateral (parallel offset) motion... basic single joint*



ADSCO ENGINEERED PRODUCTS

EXPANSION JOINTS • HEAT EXCHANGERS • STEAM TRAPS • STRAINERS • SEPARATORS • METERS

AMERICAN DISTRICT STEAM COMPANY, INC.
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y., AND RICHMOND, CALIF.



"Featherweight" 85% Magnesia was installed on the ducts, housings and lines of these "making" machines in the plant of Behr-Manning Corporation, a division of Norton Company. Insulation contractor—Armstrong Cork Company.

Heat saved . . . Money saved with K&M high temperature insulations

K&M insulations keep costs down by holding heat losses to an absolute minimum. You can always count on dependable "Featherweight" 85% Magnesia Insulation to provide exceptionally efficient heat conservation.

Made of 85% basic carbonate of Magnesia and asbestos fiber, "Featherweight" 85% Magnesia effectively insulates piping and equipment with temperatures up to 600°F. Used with K&M Hy-Temp insulation, its range is extended to 1900°F. This insulation combination lasts the life of the equipment it serves, withstands moisture, vibration and frequent temperature change.

New and now available is "Featherweight" Water-Resistant Magnesia insulation for temperatures up to 450°F. It is used underground where severe water exposure may damage the insulation or on indoor steam heated lines and equipment where high humidity and moisture are present.

Your K&M distributor is an experienced applicator who will gladly give you details about these money-saving insulations. Or write directly to us.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

Nature made asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos ®

Tempus Fugit! 40 YEARS

Remember?

1914 *First ship thru Panama Canal*

1915 *Belgian Relief under Herbert Hoover*

1916 *Pershing went after Pancho Villa*

1917 *"Over There"*

1918 *First domestic refrigerator designed by E. J. Copeland and sold by Kelvinator. G. M. Frigidaire Division started*

1919 *Dempsey ko's Willard*

1920 *Prohibition begins*

1921 *Willis Carrier invents first centrifugal refrigerating machine*

1922 *Il Duce rules Italy*

1923 *Mah Jong*

1924 *King Tut's tomb*

1925 *Florida boom*

1926 *Queen Marie visits U.S.*

1927 *Babe Ruth hits 60 homers*

1928 *"I do not choose to run." (Coolidge)*

1929 *Stock Market Crash*

1930 *Freon-12 developed by Dr. Thomas Midgeley and Dr. Albert E. Henne*

1931 *Sidewalk apple vendors*

1932 *Lindbergh kidnapping*

1933 *Chicago's World's Fair . . . Hitler rules Germany*

1934 *Dionne Quintuplets born*

1935 *FDR's Fireside Chats*

1936 *"Sitdown" strikes . . . King Edward abdicates*

Valves, Driers, Strainers, Control Devices and Accessories for Refrigeration and Air Conditioning and Industrial Applications

The First Henry product went into service just 40 years ago

That was 1914 . . . the year that "Miracle Man" George Stallings led the Boston Braves from last place on July 4 to victory in the World Series . . . the year that Kaiser Wilhelm launched World War I. In 1914 Henry Ford astounded the world with his five-dollars-a-day minimum wage, and two hundred natural ice manufacturers convened in New York City.

The development of modern Refrigeration, Air Conditioning and Low Temperature Freezing through the years since 1914 has been one of American Industry's truly great achievements. To men like Carrier, Copeland, Birdseye, Midgeley, Henne, and a host of other scientists and inventors all mankind is forever indebted. It is a privilege to have had a part in the growth of the giant industries which the genius of these scientists made possible; and to have been associated with the engineers, the executives and the salesmen who labored to bring the fruits of genius into the lives of men.

The most gratifying reward forty years have brought to us at Henry Valve is the friendship of so many people at the top and in the ranks of the Refrigeration, Air Conditioning and Low Temperature Freezing Industries.

The basis of these friendships is confidence in the products and the policies of this organization. Operating men know from long experience that Henry Valves, Driers, Strainers and Specialized Control Devices perform their functions dependably and well. Manufacturers have found that Henry advanced design and quality construction improve the sales value and the performance of their products. Contractors and service men know that Henry Products work *with* them to satisfy the customer. All of these, and wholesalers as well, know that fairness and the sincere desire to give more value per dollar are basic with Henry in all dealings.

That's the way it has been for forty years. That's the way it will be in the years ahead.

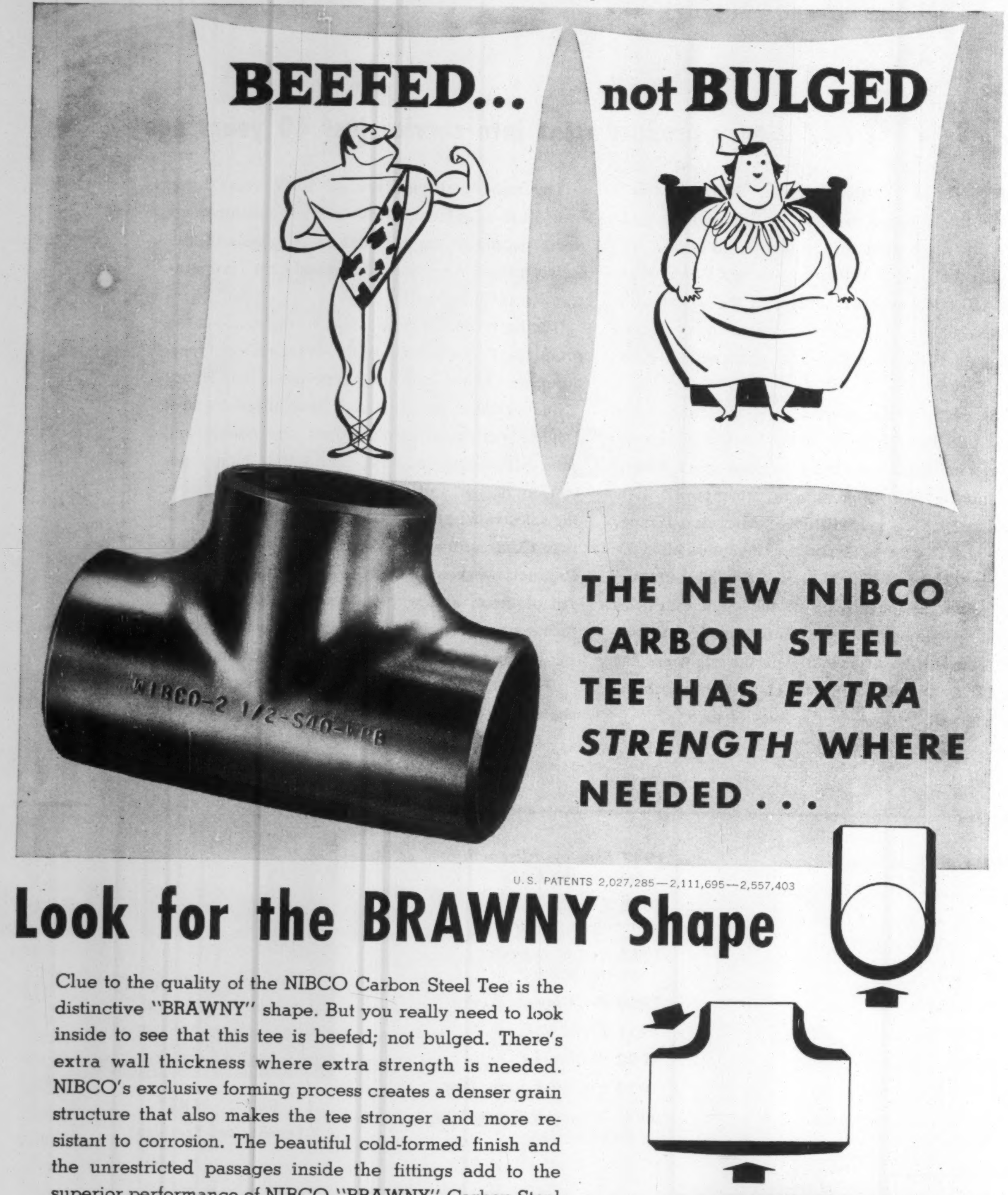
1937 *The "Recession"*
1938 *"Wrong Way" Corrigan*
1939 *World War II begins*
1940 *FDR vs Willkie*
1941 *Pearl Harbor*
1942 *Guadalcanal*
1943 *Ration Books*
1944 *Normandy Landing*
1945 *V-E and V-J Days*
1946 *First radar contact with moon*
1947 *Princess Elizabeth marries the Duke*
1948 *Truman and Citation strong in the stretch*
1949 *Russia explodes atomic bomb*
1950 *Reds invade Korea*
1951 *Truce talks*
1952 *"I like Ike"*
1953 *End of Korean War*
1954 Henry Valve's 40th Anniversary

GUY J. HENRY
Founder and President

CONTROLLING FLOW SINCE 1914

HENRY VALVE COMPANY

Melrose Park, Ill. (Chicago Suburb) • Cable: HEVALCO, Melrose Park, Illinois



THE NEW NIBCO CARBON STEEL TEE HAS *EXTRA STRENGTH* WHERE NEEDED . . .

U. S. PATENTS 2,027,285—2,111,695—2,557,403

Look for the BRAWNY Shape

Clue to the quality of the NIBCO Carbon Steel Tee is the distinctive "BRAWNY" shape. But you really need to look inside to see that this tee is beefed; not bulged. There's extra wall thickness where extra strength is needed. NIBCO's exclusive forming process creates a denser grain structure that also makes the tee stronger and more resistant to corrosion. The beautiful cold-formed finish and the unrestricted passages inside the fittings add to the superior performance of NIBCO "BRAWNY" Carbon Steel Welding Tees. You can get them through your regular source of supply.

NORTHERN INDIANA BRASS COMPANY
1071 Plum Street, Elkhart, Indiana

NIBCO

The MASSACHUSETTS *Line*®

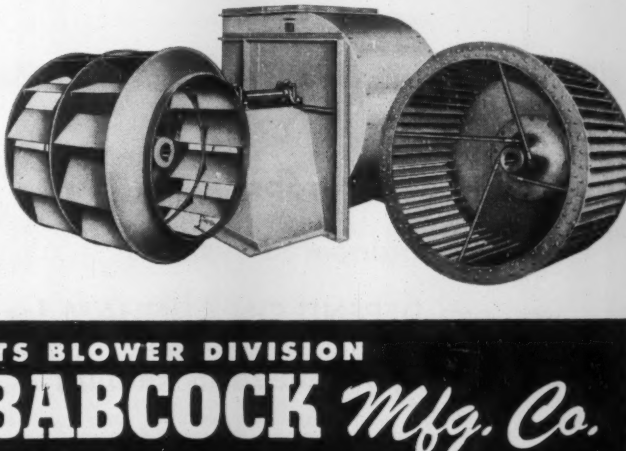
Our 75th Year

It's Time...

To Recommend MASSACHUSETTS HEAVY DUTY AIR MOVING EQUIPMENT

- Dependable ratings
- Certified by N A F M
- AUTOMATIC Inlet Vanes
- Bulletin No. 101 Squirrel Cage (Forward Curve Blade)
- Bulletin No. 105 Power Fixed (Backward Curve Blade)

Our representatives will be glad to call upon you and supply the necessary literature and information for your needs.



MASSACHUSETTS BLOWER DIVISION

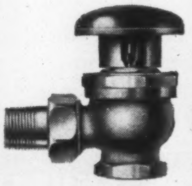
The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE • CLEVELAND 14, OHIO

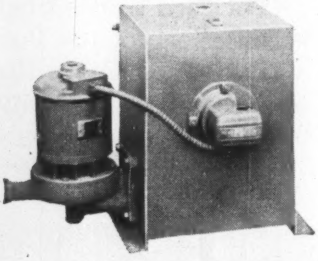
De Paul Hospital saves 47,000 gallons

DE PAUL HOSPITAL: St. Louis, Missouri.
ARCHITECT: Maguola and Quick, St. Louis.
MECHANICAL ENGINEER: Harry F. Wilson, St. Louis.
HEATING CONTRACTOR: Elliott and Barry Engineering Company, St. Louis.

From radiator traps
to fully engineered systems
you can DEPEND ON DUNHAM for
everything you need in heating

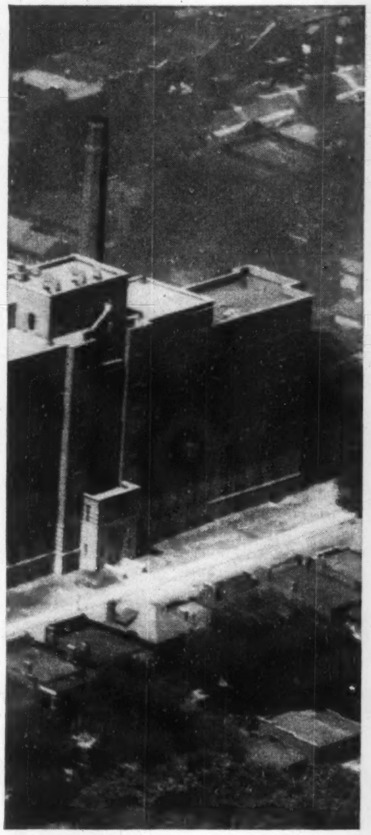


Dunham Radiator Valves. Complete line of radiator valves, traps and other specialties for steam heating.



Dunham Condensate Pumps. Single and Duplex models. Low horsepower. New mechanical seal.

# of fuel oil in one heating season . . .



with DUNHAM VARI-VAC® HEATING

Like so many others . . . De Paul Hospital, St. Louis, Missouri, wanted the most comfortable heating it could buy . . . at the least possible operating cost. So Dunham Vari-Vac heating was chosen.

The 47,000 gallons of fuel oil saved in just a single heating season quickly fulfilled its lowest possible operating cost needs. As for comfortable heating . . . hospital authorities state, "Even if we'd saved little or nothing on fuel, we'd still call Vari-Vac a good investment because of the greater comfort it gives us."

Your clients can cut their fuel costs too and enjoy comfortable heating with Dunham Vari-Vac . . . a versatile heating system that has proved time and again that fuel savings as high as 40% are not at all uncommon.

For you see . . . Dunham patented temperature controls on variable vacuum steam mains can lower fuel bills on *any* building . . . regardless of *size, type, age or location.* With Vari-Vac, outside weather conditions and inside heat losses promptly and automatically control steam consumption so that you need less steam for more comfortable heating. What's more, you can "zone heat" with Vari-Vac to meet varying conditions of building exposure and occupancy.

There's far more to both the cost-saving and comfort features of Dunham Vari-Vac. For full information, write for bulletin 2101-A. C. A. Dunham Company, Dept. HPAC-10, 400 W. Madison Street, Chicago 6, Illinois.

DUNHAM®

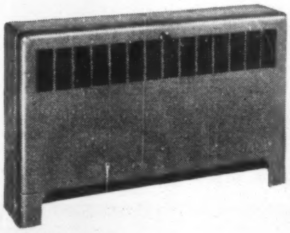
Quality First for Fifty-One Years

C. A. DUNHAM COMPANY

CHICAGO • TORONTO • LONDON

HEATING & COOLING EQUIPMENT

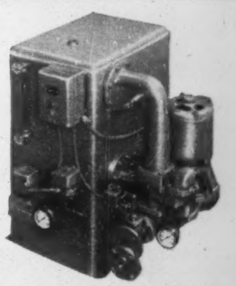
RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES



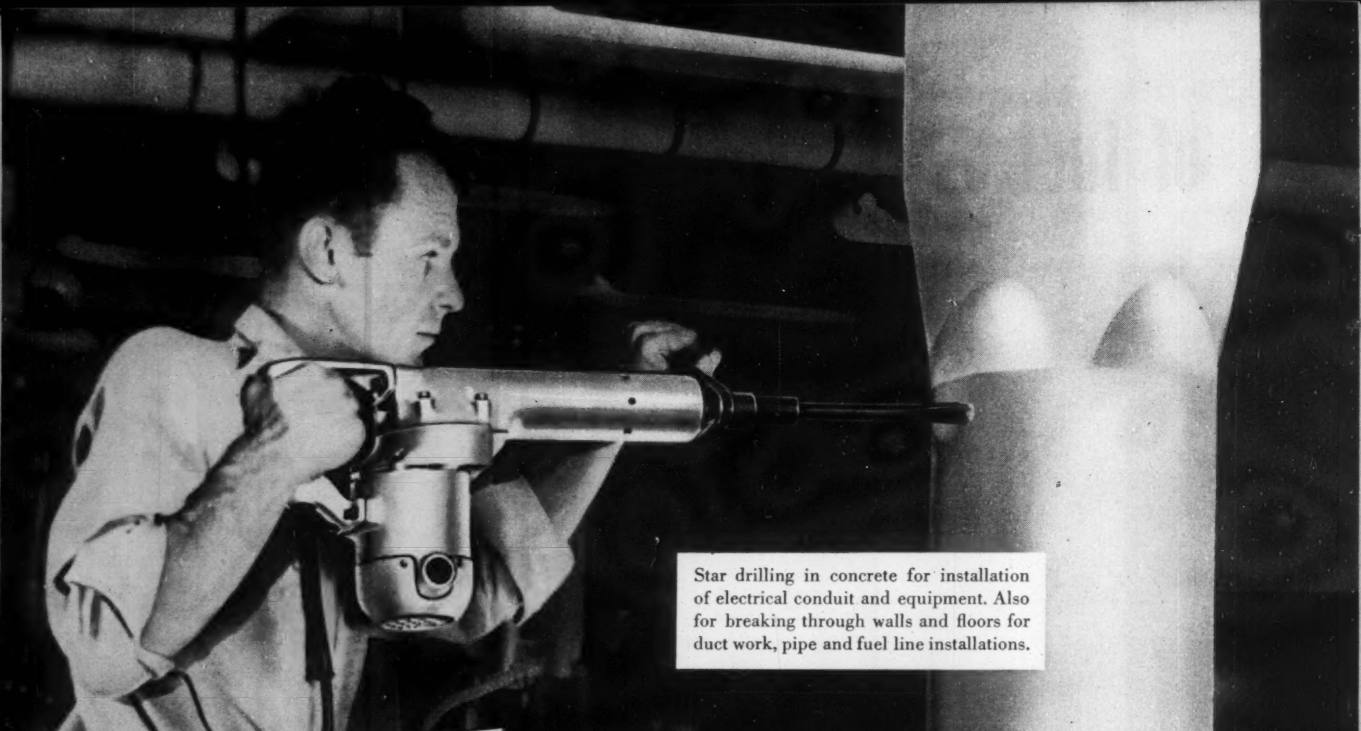
Dunham Radiation. Full range of sizes and types of convectors, baseboard and finned tube radiation.

Dunham Circulators. Heart of Dunham's complete hot water line. Single-spring motor coupling. Brand-name motor.

Dunham Unit Heaters. Line includes heating-cooling units, vertical, horizontal discharge and large blower unit heaters.



Dunham Vacuum Heating Pumps. Single and Duplex models. No close clearance parts. Only one moving element.



Star drilling in concrete for installation of electrical conduit and equipment. Also for breaking through walls and floors for duct work, pipe and fuel line installations.

Black & Decker

ELECTRIC HAMMERS GIVE

MORE POWER TO YOU

to save time ... cut costs!

To DRILL DIG PIERCE BREAK

To CHISEL GOUGE CHANNEL NOTCH

To CHIP PEEL POINT CAULK

To BATTER SHAKE SHATTER SMASH

To do HUNDREDS of JOBS in INDUSTRY FASTER, BETTER, CHEAPER!

A BLACK & DECKER HOW-TO-DO-IT BOOK

See where B&D Hammers save you time and money!

New Book shows how!

From drilling in concrete to holing-through walls, B&D Electric Hammers get more jobs done faster, better, cheaper! No other Hammer has so many features for comfort and safety. No other Hammer gives you so much working power in so little weight at such a low price! Get all the facts! Get this great B&D Hammer Handbook *FREE!* Page after page of on-the-job photos show how you can save time, cut costs on dozens of jobs in your own operation! Write to: THE BLACK & DECKER MFG. CO., Dept. 640, Towson 4, Maryland. Meanwhile, ask your B&D distributor for a demonstration!

CLASSIFIED TELEPHONE DIRECTORY TELLS WHERE TO BUY IT

For nearest distributor, see "Tools-Electric."

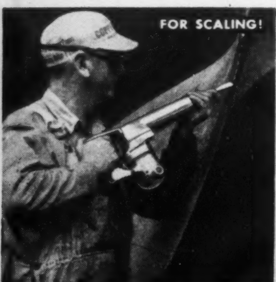
LEADING DISTRIBUTORS EVERYWHERE SELL

B&D **Black & Decker**

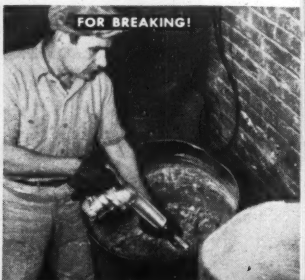
PORTABLE ELECTRIC TOOLS

FOR LAGGING-DOWN!

FOR CHANNELING!


FOR SCALING!

FOR SMASHING!


FOR BREAKING!

the best running mate *your* product can have–

DELCO MOTORS

Every Delco motor, large or small, is engineered and built to assure the uninterrupted usefulness of the product it ultimately will serve. In the wide range of Delco fractional and integral motors, you can be sure that you will find the best running mate *your* product can have.

DELCO PRODUCTS

DIVISION OF
GENERAL MOTORS CORPORATION
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Atlanta • Chicago • Cincinnati • Cleveland
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KING OF THEM ALL

BRUNER

WATER SOFTENERS AND FILTERS

Examples of Bruner industrial installations:

INDUSTRIAL

Chevrolet Division GM—Flint, Mich.
Halle Bros. Dept. Store —Canton, O.
Havana Laundry—Havana, Cuba

MILITARY

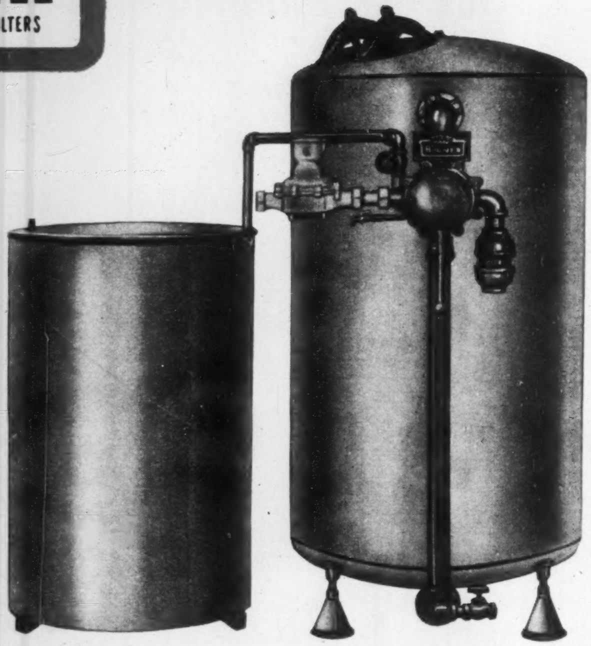
Wright Patterson Air Force Base
—Dayton, Ohio
Big Spring Air Force Base—
Big Spring, Texas

HOTELS and HOSPITALS

Jung Hotel—New Orleans, La.
Gulf Bay Hotel, Sarasota, Fla.
Exeter Memorial Hospital—
Exeter, Calif.

SCHOOLS and COLLEGES

University of Wisconsin—
Madison, Wis.
University of Missouri—
Columbia, Mo.
Peabody High School—Trenton, Tenn.



Water Softeners for Industry

Bruner Corporation has probably already installed an industrial water softener of the type and size that would be just right for *your* plant or building. Hundreds of industrial, military, municipal, and power plant installations from coast to coast, in Canada, Alaska, and South America have proven the superior performance and economy in original cost of Bruner water conditioning equipment.

Softeners with capacity up to 1,500,000 GR can be delivered from stock with important savings in time and money.

Treatment of unusual water conditions, sometimes requiring specially designed equipment, is the daily work of Dr. R. Lee Jickling, noted authority in this field and Chief Chemist at Bruner Corporation. Your correspondence will receive his immediate attention.

BRUNER CORPORATION

General Offices — MILWAUKEE, WIS.
Plants in Milwaukee and
El Segundo, Calif.

World's largest manufacturer of fully automatic water softeners — for home and industry.

EASY TO

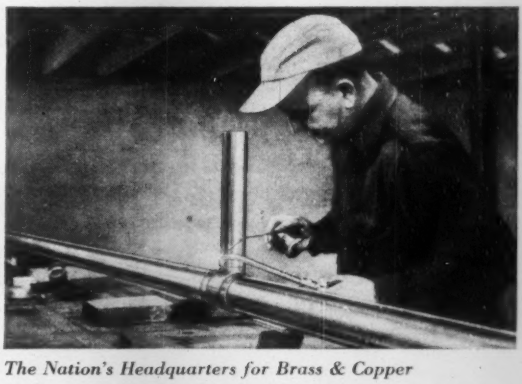
INSTALL!

Chase Copper Tube for Soil, Waste and Vent Lines Requires Fewer Joints

Chase Copper Drainage Tube comes in 20 foot lengths. That means fewer joints for soil, waste and vent lines. You'll save time not only in installation but in final pressure-testing, too.

Because it's light but rugged, Chase Copper Tube joined with Chase Solder-Joint Fittings allows you to do a considerable amount of economical pre-assembly.

You can stand by every drainage job you do with Chase Copper Tube because it can't clog with rust and stays pressure-tight. Place your next order for drainage tube at your Chase wholesaler.



Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

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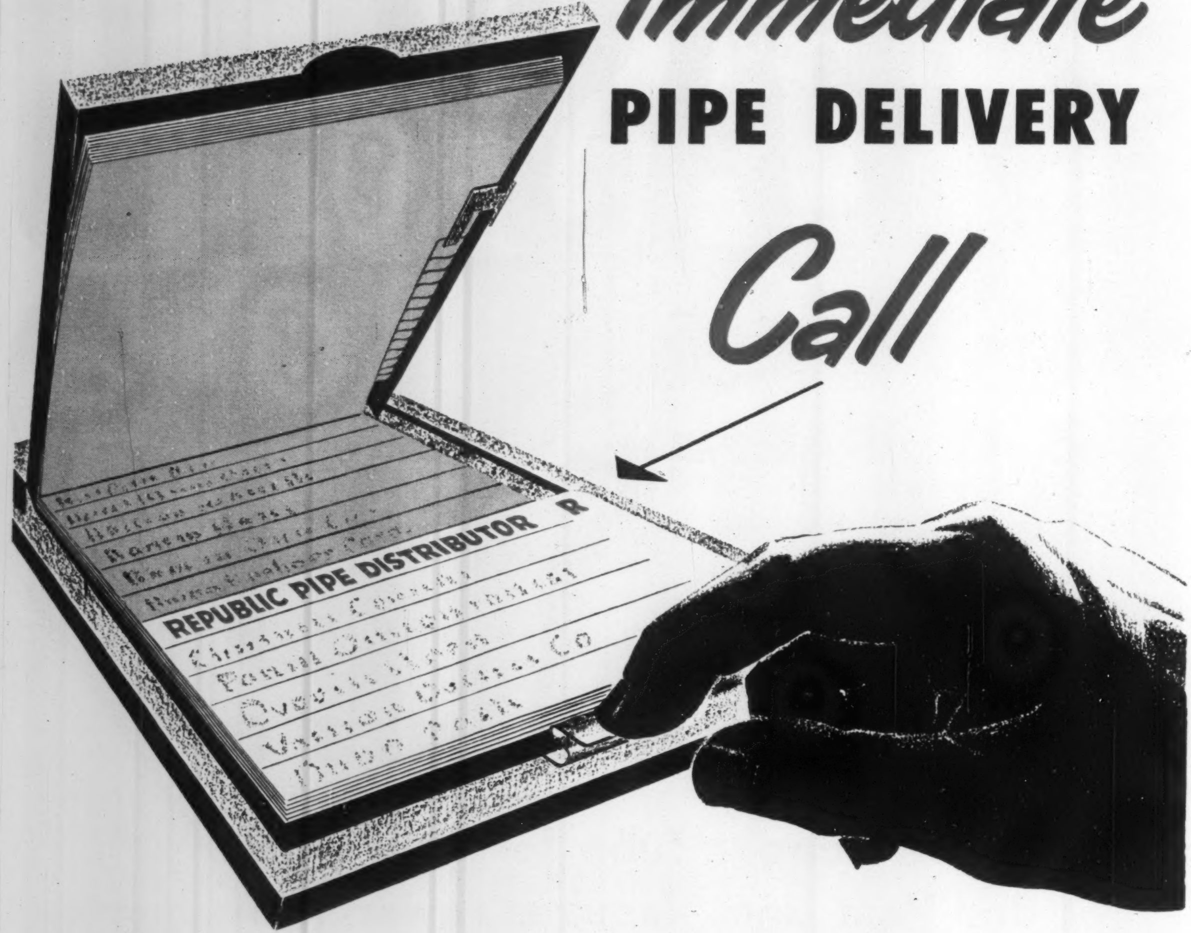
FOR *Immediate* PIPE DELIVERY *Call*



You'll discover your Republic Pipe Distributor a good man to do business with. He always has on hand a full line of steel pipe in every size—plus fittings, valves, tools, fixtures, controls—everything needed for complete installations. And whether you want a few lengths of pipe or a truckload, your phoned order will receive prompt attention *and rapid delivery.*

Make his stockroom your stockroom . . . and save yourself time and money. You can avoid large capital investments, yet have all the material you want *when you want it.* You save floor space . . . insurance . . . handling costs as well.

Keep your Republic Steel Distributor's telephone number handy. Successful operators find it profitable to take advantage of his services. Give him a call. He'll be glad to answer any questions.

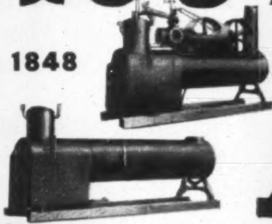
- **Easy to bend, thread, and close coil**
- **Easy to weld by all methods**
- **Uniformly ductile**
- **Uniformly strong**
- **Uniformly clean and scale-free**
- **Uniform wall thickness, diameter, concentricity**
- **Economical uniform lengths, extra long lengths**

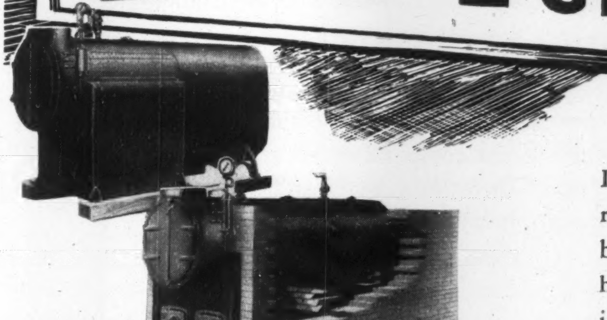
REPUBLIC STEEL

REPUBLIC STEEL PIPE

106 YEARS of RELIABILITY ARE BEHIND EVERY AMESTEAM GENERATOR

1848





In your selection of a boiler, it's important to remember — experience *does* count. And what better assurance of top boiler quality do you have than the Ames record: 106 years of building fine boilers — boilers which have given economical, satisfactory service throughout the industry! Many Ames units purchased 40 to 50 years ago are still faithfully on the job. Amesteam Generators always incorporate the latest advances in package boiler design.

Write today for details on these boilers with the proven record of reliability.

1954

AMESTEAM GENERATOR

20 sizes, 10 to 600 H.P., 15 to 200# W.P., oil, gas, or oil-gas combinations with quick fuel switchover feature.

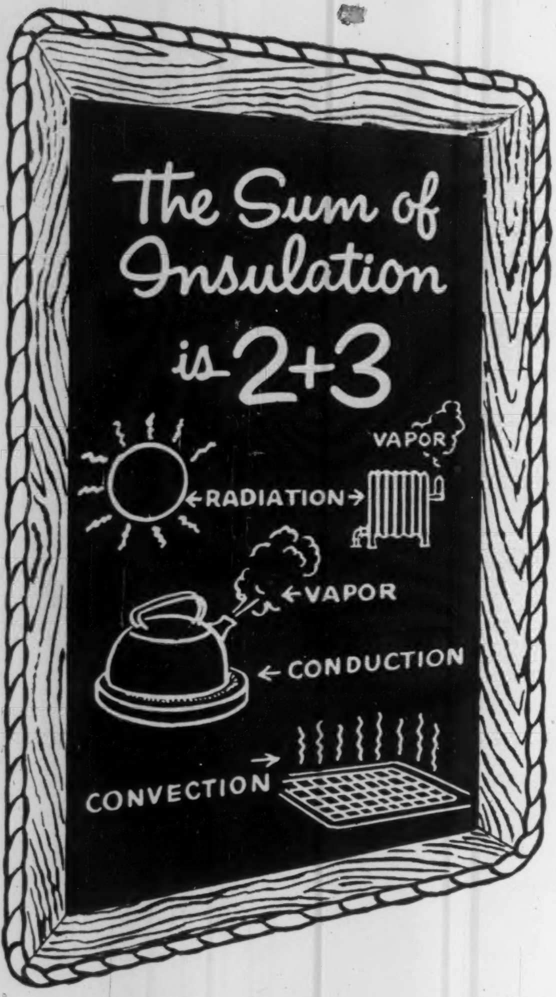
AMES IRON WORKS, INC.
Box D-104, Oswego, N.Y.

Show me how I can benefit from Ames experience and nation-wide organization in getting a top boiler value.

NAME ....

ADDRESS ....

COMPANY ....



COST OF EDGE-TO-EDGE INFRA Multiple Aluminum Insulation installed in new construction between wood joists, material with labor

Type 6-S under 9½¢ sq ft.
Type 4-S under 7½¢ sq ft.

Infra Insulation, Inc., 525 B'way., N. Y. C. Dept. H-10
Please send sample of new insulation ☐; Bureau of Standards Report "Moisture Condensation in Building Walls"—BMS63 ☐; Description of new insulation ☐.

Name____________________
Firm____________________
Address____________________

INFRA INSULATION, INC., 525 Bway., New York, N. Y.

FIVE-WAY protection is required of an insulation against (1) CONDENSATION, (2) VAPOR FLOW, as well as against Heat Flow by (3) RADIATION, (4) CONDUCTION, (5) CONVECTION.

Multiple accordion aluminum provides this 5-fold protection. It is pre-fabricated to automatically create a "blanket" of multiple alternating layers of air, aluminum and fiber as it is installed.

Against RADIATION there is high (97%) reflectivity, low (3%) absorptivity and low (3%) emissivity for heat rays. CONDUCTION is low because of preponderant compartmented air spaces of low density. CONVECTION, outer and inner, is retarded by multiple layers of aluminum and fiber.

CONDENSATION MINIMIZED

The aluminum sheets are almost completely impervious to water vapor. Infiltration under flat, stapled flanges is slight. The scientific construction of multiple layers of accordion aluminum, fiber and air spaces minimizes condensation on or within this insulation. Its slight mass produces little heat storage.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, it is necessary to use the new **edge-to-edge** multiple aluminum*, **each** sheet of which stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet.

The U. S. NATIONAL BUREAU OF STANDARDS has published an informative and authoritative report on "Moisture Condensation in Building Walls." This booklet explains the conditions under which condensation will take place in insulated as well as uninsulated walls; what part is played by effective vapor barriers such as metal foils; how to use and interpret thermal-resistance and vapor-resistance fractions. You can obtain it at our expense by sending us the coupon.

*Patent applied for.

THE EDITORS' PAGES

• *THE AUDIT BUREAU OF CIRCULATIONS, whose insignia is shown here, is commemorating its 40th anniversary this month. You have seen this symbol on HPAC's contents page each month. It stands for the confidence both readers and advertisers have in HPAC's editorial policy and circulation strength. The function of the ABC is to measure and verify the net paid circulation of member publishers. With more than 3500 other paid-circulation publications, HPAC proudly salutes the ABC.*

New Air Conditioned Plant Cited

. . . described in HPAC

ALTHOUGH it's only an infant in Chicago's great family of factories, the C. P. Clare & Co. plant, described in the article, *New Windowless Air Conditioned Plant "Made to Order" for Precision Manufacturing*, in the September HPAC, has been awarded a citation for its outstanding design, landscaping and attractiveness.

The citation refers to the new plant as a "symbol of better life." It points out that in this plant employees may produce more goods for more people because of the pleasant and comfortable surroundings. Of course, the comfortable surroundings include year 'round air conditioning throughout the plant.

Adequate Water Supply Urged in Fighting Fire

. . . asks revised construction code

OCTOBER 3-9 marks the 35th annual Fire Prevention Week. Attention is again being directed to the ever increasing need for greater fire safety and protection.

The importance of emphasizing fire safety precautions is evident from the fact that building fires have been increasing slightly each year, from 311,280 in 1942 to 416,543 in 1953, according to the National Board of Fire Underwriters.

Despite the progress in building construction — from $14 billion in 1942 to $35 billion in 1953 — the hazard of conflagration still exists in many cities, says the NBFU.

Consulting engineer of the NBFU, James K. Evans, says, "The hazard, which may involve a group of buildings, an entire block, or a whole commercial or residential area, depends on several factors. These are construction, fire protection, separation of buildings, and the availability of public fire fighting facilities, such as fire departments and water supply systems of such quality and efficiency as would be needed."

Any further development of our cities, he holds, "must be predicated upon raising the general level of building construction, enforcement of building regulations, and the adequacy of fire-fighting facilities."

Construction Continues at Boom Rate

. . . '54 sets new record

CONTRACT AWARDS for future construction in the 37 eastern states broke several all time high records for August in the 63 year history of the F. W. Dodge Corp.

It was the highest August on record: $1,572,865,000, up 11 percent over August 1953 and down only 14 percent under the monumental total of July 1954, which set an all time July record. It rounded out the highest first eight month total in Dodge history: $12,660,949,000, up 14 percent over the first eight months of 1953.

In nonresidential contracts, it set a new high August record: $550,550,000, up 1 percent over August 1953; down 14 percent from July. A fair percentage of contracts in this type of construction will be in progress well into 1955.

The August and eight month totals brought the prospect that at the year's end a new high record for annual volume will have been set; if so, it will be the ninth consecutive year of construction volume gains. The first eight months averaged $1,582,617,000; the remaining four months need average only $1,195,630,000 to break all annual records.

Thomas S. Holden, vice chairman of the Dodge Corp., commented: "The grand total of contract dollars thus far this year has already gained over the corresponding period of last year an amount equal to the 1953 monthly average."

Room Air Conditioner Shipments Increase

. . . 1954 greater than 1953

AN INCREASE of 35.9 percent in the shipments of room air conditioners by manufacturers during the first six months of 1954 over the first six months of 1953 has been announced by Geo. S. Jones, Jr., managing director of the Air-Conditioning and Refrigeration Institute.

Over a million units — about 1,063,000 — were shipped by manufacturers during the first six months of 1954, compared with 782,066 units shipped during the same period of 1953.

Philadelphia Widely Air Conditioned

. . . here are the figures

TEN OFFICE BUILDINGS with a total rental area of 1,875,875 sq ft are now completely air conditioned, including the Central Penn Bank, Packard, Penn Mutual, Pennsylvania, Philadelphia Saving Fund, Public Ledger, Stephen Girard, 1422 Chestnut St., 1530 Chestnut St. and 226 S. 16th St. buildings.

Five office buildings, with a total rental area of 1,688,163 sq ft are now in the process of being completely air conditioned, including the Fidelity Philadelphia Trust, Lincoln-Liberty Suburban Station, 1500 Walnut St. and 1616 Walnut St.

Air Conditioning Profits and Sales Are Up

. . . but orders booked are down

A NET PROFIT of $7,094,770 for the 12 months ending July 31, 1954 has been reported by Carrier Corp. In the preceding similar period, the earnings were $5,895,454.

During the period, completed sales totaled $161,100,186, and new orders were booked in the amount of $150,177,658. The comparable figures for the 12 months ending July 31, 1953 were $153,782,463 and $171,518,550, respectively. On July 31, 1954 the backlog of unfilled orders amounted to $38,327,763 as compared with $49,250,291 a year earlier.

With respect to fiscal 1954 as a whole, Cloud Wampler, president, said: "Our volume will not be as large as the record total of last year. As anticipated, our business with the Government is down considerably. And the increase in civilian orders, while substantial, has not been sufficient to offset this."

Mr. Wampler also stated: "Although our business has been good this year, it is below expectations in completed sales of unitary equipment, especially room air conditioners. This is a condition which apparently prevails throughout the industry and was caused by abnormally cool weather this spring and summer and the confused price situation resulting from the large number of concerns that recently entered the room air conditioner business."

Commenting further on the industry, Mr. Wampler expressed the opinion that it is going through a period of adjustment and that for some little time profit margins are apt to be unsatisfactory. On the other hand, vigorous competition and better values will certainly cause more and more people to purchase air conditioning equipment, and this augurs well for the future of the industry.

Peak Electric Load Shifting to August

. . . because of air conditioning

AIR CONDITIONING has created a heavy demand for electricity during the summer months in the last few years. Until now, the trend in many areas is toward a year's peak in August rather than the traditional peak in December. Accordingly, utility men in some areas are showing interest in electric heating as a way to balance the power load on a year 'round basis.

Gas Operating Revenues Reach Record High

. . . for 12 months past

TOTAL OPERATING revenues of the gas utility and pipeline industry reached a record high of $4,434 million during the 12 months ending June 30, 1954, the American Gas Association reports. This is a gain of $489 million, or 12.4 percent over the figure for the comparable period one year earlier. Net operating revenues increased from $544 million to $589 million in the same period, a gain of 8.3 percent. Net income was $435 million in the cumulative period, a gain over the year earlier of 6.4 percent.

Customers served with natural gas on June 30, 1954, aggregated 21.2 million, and represented 78.3 percent of total gas industry customers. A year earlier there were 19.6 million natural gas customers, representing 74.9 percent of the total customers.

"Quote"

"When do I expect to move into my new building? We're hoping to make the move in the next couple of months. We've been held up by one thing, though — the installation of the heating system." — *A heating and air conditioning contractor, in conversation last month with one of HPAC's editors.*

Centennial to Mark Progress

. . . in 1955

THE 100th birthday of Crane Co. will be observed on July 4, 1955. The centennial will be celebrated at the Chicago general office, plants, branches and subsidiaries during the entire calendar year, 1955, with special events of national significance.

It was on July 4, 1855, that 23 year old Richard Teller Crane, the founder, opened a one room, self built shop in Chicago, which then had a total population of 75,000.

This rise from humble beginnings a century ago to a multi-million dollar corporation, with sales of more than 315 million dollars in 1953, is a typical American success story. The company began by supplying a modest quality product—brass lightning rod tips—to a small, local market. It has grown with the city and the nation to a point in its career where its 40,000 products are used in factories, farms, offices and homes throughout the country.

More information about this event will be presented in these pages as additional plans are formulated.

Catalytic Scientist Honored by Award

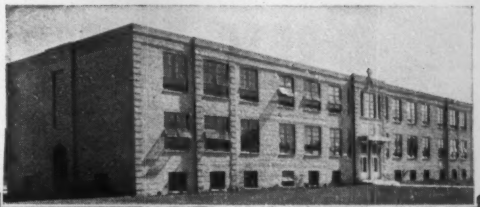
. . . has aided smog problem

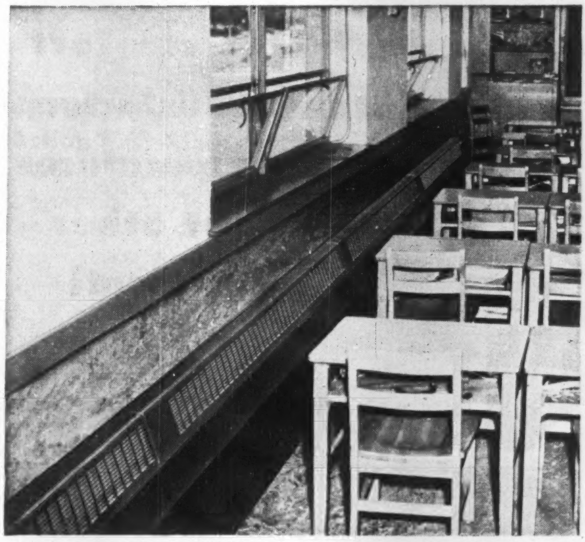
BEFORE A dinner meeting of scholars, scientists and civic leaders, Eugene J. Houdry was recently presented with the John Scott medal award by the Board of Directors of City Trusts in the Philadelphia Engineers Club.

The award — a copper medal, a scroll and $1000 — was created by a Scottish chemist in 1816 "for ingenious men and women who make useful inventions." It has been given over the years to a parade of the world's scientific greats. Houdry received it in recognition of his achievements in the catalytic cracking of petroleum.

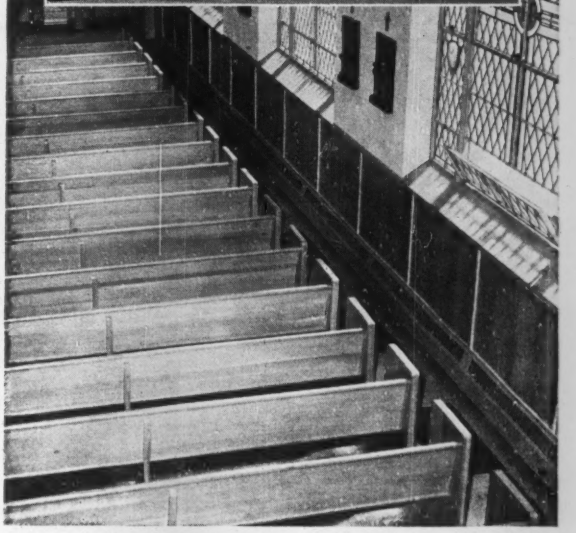
In recent years, he has developed an oxidizing catalyst that consumes manufacturing pollutants, such as those which contribute to smog. It is being used, or engineering plans are being drafted for its use, in more than a score of different industries to control air pollution.

This new church-and-school building of St. Joseph's Parish, Toms River, N. J. combines economy in initial cost with quality in every important design feature. Floor space, 40,894 sq. ft. Architects: Wm. W. Slack & Son, Trenton, N. J. Heating Contractor: John G. Carr, Trenton, N. J. General Contractor: Daley & Co., Trenton, N. J.





In classrooms, Webster Walvector, installed along exposed walls, provides warmth where heat loss occurs, eliminates down-drafts.



Webster Tru-Perimeter Heating with Webster Walvector affords wall-to-wall warmth in the high-ceilinged church.

It's a School *It's a Church*
with Tru-Perimeter Heating in Both

Just 8% of total construction cost . . . $41,230 is what it cost to equip this dual purpose building with Webster Tru-Perimeter Heating and Webster Moderator Control.

Completed in 1952 at a cost of $509,240 (excluding land, financial and legal expenses), this new church-and-school building of St. Joseph's Parish, Toms River, N. J., is now accommodating 550 pupils, although its capacity is 800 — ample to take care of future needs.

Webster Walvector, as shown in the classroom and church above, is teamed with Webster Moderator Control to provide heating comfort without wasteful overheating. Walvector provides gentle, even warmth where heat loss occurs, and eliminates down drafts. With the Webster Moderator System, a Webster Outdoor Thermostat speeds delivery of heat when outdoor temperature falls, and slows down delivery when outdoor temperature rises. This heating system is always in proper balance — delivers heat in the desired amount for each room or section of the building. Shut off one room or an entire floor and the system automatically compensates for the decreased demand. Webster meets the need for extra heat at the rear of the church and cafeteria, also on corridors and stairs — with Unit Heaters and Webster Convectors.

Whether for modernization or for new construction, get the facts on Tru-Perimeter Heating with Webster Walvector and Moderator Control. Call the Webster Representative, or write us.

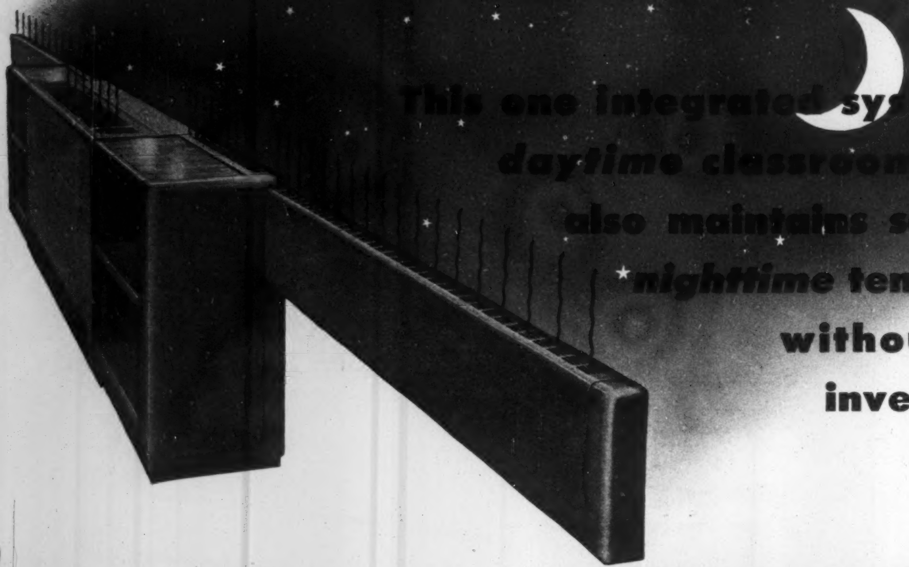
Address Dept. HP-10
WARREN WEBSTER & COMPANY
Camden 5, N. J., Representatives in Principal U. S. Cities
In Canada, Darling Brothers, Limited, Montreal

WEBSTER
MODERATOR
TRADE MARK REG. U.S. PAT. OFF.
SYSTEM
OF STEAM HEATING

"Controlled by the weather"

AND **Other Webster Heating Equipment for institutions includes Tru-Perimeter Heating with Webster Baseboard; Webster Control for Hot Water Heating; Webster Radiator Traps and Valves, Drip Traps and other Steam Heating Specialties for heating and process applications; Unit Heaters.**

Buy One and Get Two!



This one integrated system for *daytime* classroom comfort also maintains satisfactory *nighttime* temperatures without other investment!

It is generally agreed that classroom temperatures should be maintained at about 55° overnight and during periods of shut-down in cold weather. This permits quick recovery to comfort conditions and more stable control during the first hours of the next school day.

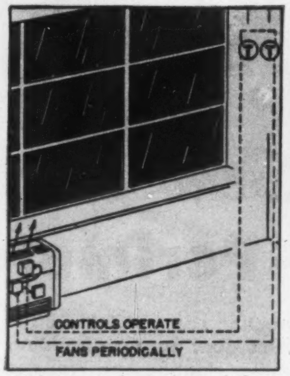
Cutting off the heat altogether, and letting the classroom temperature drop to 40° or 45°, makes the recovery difficult—particularly in restoring heat to the floor slab, walls, desks, etc.—and leads to morning room-temperature fluctuations, possible overheating, and abnormal bodily heat losses to surrounding objects.

In designing unit ventilator systems to maintain an optimum overnight temperature, either of two methods have been employed: a) operating the units as heaters (recirculation only) under thermostat control; or b) installing supplementary gravity heating with additional piping and controls.

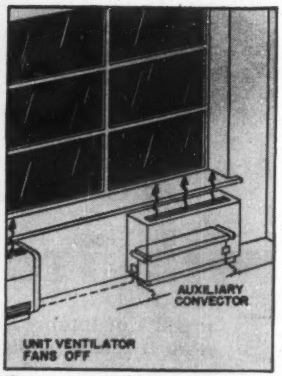
Extensive field tests have proved that when Wind-o-line Radiation is integrated with Nesbitt Syncretizers, the combined gravity heating capacity is ample to maintain overnight temperatures of 55° in zero weather. Hence this one system that sets the standard for daytime performance eliminates the cost of separate provision in each room for maintaining overnight temperatures, and simplifies—for greater economy—the control of overnight temperatures from one location in the building.

Get more for your school building dollar . . . go NESBITT.

Send for Engineering Report SL-6.

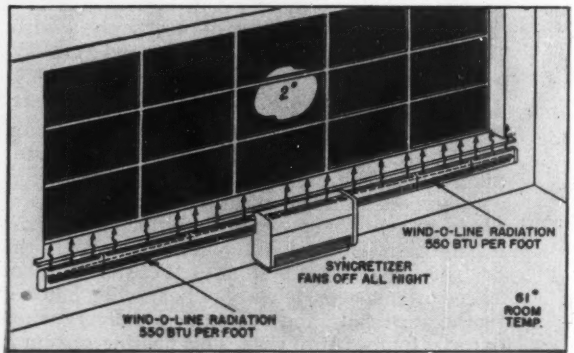


Added controls operate unit fans periodically through the night.



Convector provides supplementary heat, but is not used during day.

ABOVE: THE OLD WAYS — BELOW: THE NESBITT WAY


2°
WIND-O-LINE RADIATION 550 BTU PER FOOT
SYNCRETIZER FANS OFF ALL NIGHT
61° ROOM TEMP.
WIND-O-LINE RADIATION 550 BTU PER FOOT

Gravity heat of Syncretizer and Wind-o-line maintains satisfactory overnight temperatures—without additional equipment or controls.

NESBITT *Syncretizer* WITH WIND·O·LINE

MADE AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PA., SOLD ALSO BY AMERICAN BLOWER CORPORATION.

"OPEN FOR DISCUSSION"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

R. A. MILLER —

"I Propose a Separate Suction Line for Pump"

I ENJOYED reading the article in the September HPAC by Bill Dopp, *The Case of the Musical Pump, or How Much Damage Can Piping Do?* I am not a piping expert, but I would like to comment on the subject of pump performance when turbulence is a factor.

Turbulence at the impeller inlet would surely make the pump run rough and cause vibration, because a portion of the vanes of the impeller would be taking a bigger bite of the fluid and thus cause an unbalanced thrust. It may be possible for this thrust to cause rubbing and possibly a squeal, as mentioned in Mr. Dopp's article.

The rattle that occurred when the discharge valve was opened wider, was undoubtedly caused by so called cavitation which is actually partial vaporization or flashing at the pump inlet. As these bubbles progress into higher pressure areas within the pump, they collapse, causing myriads of water hammers and brother, do they sound like hail on a tin roof. The cause of this is too much friction in the suction line resulting in too little available net positive suction head at the pump inlet.

The article did not state whether No. 3 pump was running at the time. However, since the other pump's suction was cut into No. 3 suction line, it is quite possible that the pipe was not large enough for both pumps. In that event, even though the No. 2 pump would rattle when both were operating, straightening out the suction line would not be the cure. A separate suction line for the new pump would be required. — R. A. MILLER, Centrifugal Pump Section, Allis-Chalmers Manufacturing Co.

THE AUTHOR'S REPLY — Mr. Miller's comments are appreciated. The matter of NPSH — net positive suction head — was not discussed in the September article, as it is being reserved for later discussion.

Mr. Miller's comment further verifies that pump operation is not always as smooth as is desired. Obviously, there are several reasons for this. That piping strains do contribute materially to pump troubles, there can be no doubt.

Mr. Miller seems to agree with Mac that turbulence can also be an important factor in producing noise and rough operation in a centrifugal pump. It is an open question whether this same turbulence can also be responsible for at least some of the cavitation and subsequent vibration, which he mentions. We do know that it does under certain circumstances cause cavitation, which produces extreme vibration and noise in pipe lines and other apparatus.

The suggestion of a separate suction line for No. 3 pump is well taken. Although No. 2 pump was not running at the time, it probably would have made the situation worse when it was started. The main point of this article, however, was to bring out the effect of both piping strains and turbulence on pump operation. Either or both are often present, though unsuspected, and cause a lot of serious trouble for which other things get the blame. — BILL DOPP.

HAROLD W. ALYEA —

"I Suggested Simple Pressure Reducing Valve"

REFERRING to Mr. Smith's comments in the September HPAC about my four articles, *How to Control Unit Ventilators in School Buildings*, which appeared in the October 1953 HPAC and the three following issues, I would like to reply by stating that nowhere in the four articles did I suggest the need for a constant differential across the control valve. As my reply to Mr. Smith in the August HPAC pointed out, good automatic control valves are designed to accommodate a variable differential, otherwise a differential control such as Mr. Smith suggests would be needed on all systems employing automatically controlled steam valves.

We are confusing the terms "constant" and "stable." My articles pointed out the bad effects of unstable conditions caused by intermittent operation of the boiler and vacuum pump. These intermittent operations occur at random and with a frequency which does not give the controls time to settle down.

A simple pressure reducing valve was suggested as part of the answer, combined with a reasonably narrow differential on the vacuum pump, which will permit stable control. Such a solution seems much simpler than installing zone controls.—HAROLD W. ALYEA, Chief Field Engineer, Johnson Service Co.

STEVEN SENKO —

"I Want to Answer the HTHW Questions"

BOTH Mr. Smith and I appreciate Mr. Lieberg's complimentary remarks in the August HPAC about our article, *HTHW Serves Personal Products Plant* 13 *Years*, which was published in the July HPAC.

Since Mr. Lieberg stated in his comments about our article that no steam should be taken from a high temperature hot water boiler for soot blowing or any other requirement, I would like to explain why steam was taken from the HTHW boiler in our plant. I am inclined to agree with Mr. Lieberg when large quantities and continuous draw-off of steam are taken. It certainly should be made through the heat exchanger, similar to what we use in our paper mill. However, with the small amount of steam that is used for soot blowing and fuel oil heating, our operations are not affected here. To me, it is unwise to spend thousands of dollars for equipment that might have approximately two hours use in a 24 hr period.

Mr. Lieberg also asked for additional details about why we changed from bronze to steel valves. We found that considerable corrosion took place in the threaded portion of the steel pipe where it entered the valve. My experience has been where two dissimilar metals are used with high temperature hot water, electrolysis sets in. Thus, we replaced the bronze valves with steel body valves. — STEVEN SENKO, Engineer, Personal Products Corp.

H. I. MILLER —

"Here's 'mr' Explained for Uranium Dust Article"

I WOULD like to explain and clarify the term "mr" as used in my article in the September HPAC, *Controlling Uranium Dust*.

The term "mr" is an abbreviation commonly used for the term "milliroentgen," a unit of measurement of the energy of radioactivity. The energy at any given point in the vicinity of radioactivity may be directly measured with instruments, but cumulative exposure of persons working in areas subject to radioactivity is usually measured over a definite period of time by the degree of darkening of a standard photographic film worn as a badge and subsequently developed and evaluated in a standard manner. Persons may be exposed to high mr radiation levels for short periods of time, often necessary in maintenance work, but are required to compensate by low or zero exposure at other times so that the allowable cumulative amount for the week is not exceeded.

Protection is obtained by interposing distance or dense barriers such as concrete, iron or lead between radioactivity sources and the recipient, or by limiting the time of exposure.

The roentgen, of which the mr is one-thousandth part, is a physical unit first applied to X-ray radiation and later applied to radioactivity radiation.—H. I. MILLER JR., Senior Project Engineer, Catalytic Construction Co.

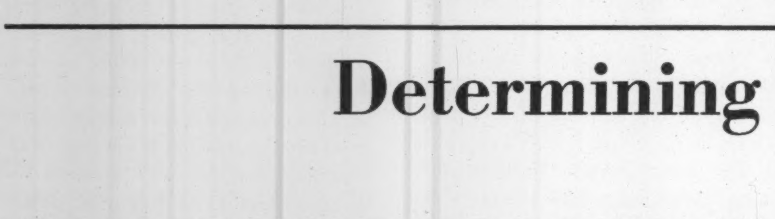
C. T. BAKER —

"I Like Refrigerant Piping Article"

I HAVE READ with much interest the article in the September HPAC, *How To Hook Up Refrigerant Piping*, by Lincoln R. Scafe, on methods for hooking up two or more reciprocating compressors so that the oil level in each will remain constant, or practically so.

I agree with Mr. Scafe's findings and recommendations, and I am satisfied that they are sound. I have

Determining Moisture in



SAMPLING AND VAPORIZING system used by the National Bureau of Standards to determine the moisture content of a circulating refrigerant before and after passage through the dryer of refrigerating system

A SIMPLE and rapid method for determining the water content of a circulating refrigerant of the fluorocarbon group has been developed by A. W. Diniak, E. E. Hughes and M. Fujii of the National Bureau of Standards. It is based on the change in electrical resistance of an electrolytic film as it absorbs water vapor.

In commercial refrigeration systems the presence of water in the refrigerant constitutes a problem because freezing of the expansion valve and corrosion are always possibilities.

Once a sampling and a return point have been placed in the system, the measuring apparatus can be quickly connected and a determination made in 15 or 20 minutes.

The principle of the method has been used at NBS for some time, chiefly to measure small amounts of water vapor in gases. A thin film of hygroscopic material—usually a mixture of sulfuric and phosphoric acids—is spread over the surface of a hooked up a number of installations using two compressors, and have always found that they work satisfactorily when the crankcases are connected together at the bottom as well as above, at the oil line.

I use nothing smaller than a 2 in. connection between compressors for equalizing the oil level in the crankcases. The minimum size equalizing line above the oil level, which I use, is 1¼ in. If the compressors are set so that the bottoms of the crankcases of the two units are level, and liberal size equalizing pipe connections are used, satisfactory operation will result.

Another thing that I specify is that a gage glass be provided for each compressor, so that it is possible to see where the oil level is without lying down on the floor and trying to determine the oil level through a dirty bull's eye which does not give a true indication. Of course, we usually get the story from most of the manufacturers that it is impossible to place a gage glass on the crank case of their machine. However, this is largely a matter of living strictly by the book of rules, and when I run into this situation, I have the work done in a local machine shop. The machine shop mechanic does not know that the job cannot be done; therefore, he proceeds to do it.

I have equipped all "Freon" compressors that I have installed with oil level indicating glasses. They are a tremendous improvement over the glass bull's eye.

I consider Mr. Scafe's article an excellent one.

—C. T. Baker, Consulting Engineer

I. A. NAMAN —

"Here's How A.C. Capacity Was Increased"

The comments of H. L. Nachman in the April HPAC about our article published in the January HPAC which described the air conditioning installation in the Harris County court house in Houston are greatly appreciated. These comments give me an opportunity to explain the points Mr. Nachman raised in more detail.

The point about bypassing the chilled water coil with "treated" outdoor air is done for purposes of ease in temperature control, as mentioned previously, but there is a definite advantage, also, in maintaining a higher mean effective temperature difference between air and water as the result of not mixing the cold, treated air in the return. In addition, the coil face area may be reduced in some cases by not requiring the coil to handle the total air volume of the unit.

In order to use "Freon-114" in the refrigeration plant, the four changes required are given here. First, the condensers and chillers were retested for the higher pres-

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a Circulating Refrigerant

. . . *NBS develops new method*

solid insulator between metallic electrodes in a pressure-tight enclosure. The electrolyte tends to reach equilibrium with the water vapor in the surrounding gas and to form a solution whose electrical conductance is a measure of the concentration of water vapor in the gas. This conductance is indicated by a simple electronic circuit and a microammeter.

A gas of known moisture content is used to calibrate the film after each reading. By adjusting the pressure of the comparison gas until the same conductivity reading is obtained for both the known and unknown gas, the two gases can be made to have the same water concentration. The unknown water content can then be calculated from the two pressures and the known water content of the comparison gas at atmospheric pressure.

Because of the pressure relationships involved and because a liquid would wash away part of the hygroscopic film, the electrical conductivity method can only be used to make moisture determinations of samples in the gaseous state. Thus, in the equipment constructed at NBS, a very small amount of the circulating refrigerant is "detoured" from the system, vaporized by heating, passed through the pressure chamber containing the hygroscopic film, and returned to the suction line for recirculation.

To prevent fractionation which would take place if only a part of the liquid sample were vaporized, it is necessary to withdraw the sample through a capillary tube so that the entire sample may be continuously vaporized. The capillary tube, dipping into the main stream of liquid refrigerant, carries a portion of the liquid to an electrical resistance heater which vaporizes the refrigerant. To ensure complete vaporization, the tubing containing the liquid refrigerant is wound loosely around the heater in the form of a helix and is thermally insulated from the ambient air. The vaporized refrigerant is then led to the detector block—a specially built, pressure-tight enclosure containing the moisture detecting element. By manipulating three control valves in the detector block, either refrigerant vapor or the comparison gas can be caused to flow past the hygroscopic film. However, the detector block is so constructed that the flow of refrigerant vapor through it is never interrupted; it is merely cut off from the detecting film. Condensation of the refrigerant in the detector block is prevented by placing the heater near enough to keep the refrigerant heated to just above its saturation temperature at the pressure of the liquid line. After leaving the detector block, the refrigerant vapor passes through a regulating valve which controls and limits flow through the sampling circuit to prevent bypassing the evaporator; it then returns to the main line of the refrigerating system for recirculation.

sures. A smaller impeller was installed on the compressors, but the same compressor frames were retained. A stage was added to the steam turbine, but the same frame was used. A new surface condenser was purchased. The increased loading on the refrigeration condensers and chillers reduced the efficiency of the system below that which would normally have been specified if new equipment were being purchased. As explained previously, this was the most economical solution.—I. A. NAMAN, Consulting Engineer.

BERNARD D. BLOOMFIELD —

"Design Exhaust Hood Based on Face Velocity"

THIS IS in reference to the article on Sam Lewis' Page in the August HPAC, *Removing Objectionable Gases from a Laboratory*. I would like to offer a few comments which I believe are pertinent. However, from Mr. Lewis' description, I would judge that the laboratory he has commented on is not commonplace, and I feel somewhat handicapped by lack of accompanying photographs or a description of the laboratory functions.

Without these details, we can still discuss some of the general and fundamental considerations regarding laboratory ventilation. The most important design factor is the exhaust volume per hood or, expressed in another manner, the hood entrance velocity. Mr. Lewis states that "experience has suggested a minimum air velocity through the doors into the fume hoods, no matter to what degree these doors are open, of 150 fpm."

During recent years, a considerable amount of work has been done on laboratory hoods for the purpose of determining minimum face velocities. The ultimate objective was to arrive at the best means of fume control with a minimum volume of air exhausted, thereby conserving conditioned air. As can readily be realized, the total exhaust volume is appreciable at large research centers such as those maintained by the large chemical companies and at some of the A.E.C. installations. The study results to date indicate optimum hood face velocities ranging from 65 to 100 fpm. Velocities in excess of 100 fpm tend to be disadvantageous because of the effect on the work being conducted in the hood such as the handling of fine powders or some operation necessitating the use of a delicate flame.

The recent study by Mr. H. F. Schulte[1] entitled *Evaluation of Laboratory Fume Hoods*, which was conducted at the Los Alamos Scientific Laboratory, indicated that "an average face velocity of 100 fpm and a minimum face velocity of 80 fpm at any point on the hood face is necessary for handling substances of moderate toxicity." The article further states that "normal heat loadings will not adversely affect the performance of the hood with an average face velocity of 100 fpm. Hoods with very high heat loads should have a major portion of the air exhausted through the top slot."

Again qualifying my comments with the fact that I am not familiar with the details of the installation and laboratory operations discussed by Mr. Lewis, I should like to state that few laboratory hood installations involve the extensive series of pressure sensitive controls discussed in the article. Generally, the design technique is based on an average face velocity into the hood of 100 fpm with provision for bypassing air into the exhaust duct if the hood doors are closed. Since some laboratory operations are conducted with hood doors closed, it is necessary to provide for a minimum volume of air exhausted through the hood at all times. A balanced system can be obtained with the use of either a sensing device incorporated in the hood inlet or a link operated proportional bypass.

It has been found that air foil shaped hood openings produce a better entrance air flow pattern and allow for a reduction in the total volume of air exhausted. However, I am of the opinion that the majority of laboratory hood installations are of common rectangular shape with no special entrance features.

A supply of make-up air equal in volume to the total amount being exhausted from the hood or laboratory building is important, as Mr. Lewis states. However, here again, I do not believe that under ordinary conditions the barometric pressure factors require the installation of special controls. The important thing is to balance out the supply and exhaust volumes.—BERNARD D. BLOOMFIELD, Ventilation Engineer, Div. of Occupational Health, Michigan Dept. of Health.

ARTHUR J. HESS —

"HTHW Articles Most Interesting"

I HAVE enjoyed reading the two articles by S. A. Kuli on high temperature hot water heating that were published in the January and February HPAC. It is indeed most interesting to read of the parallel developments in Europe, especially since they were ahead of us in the art of high temperature hot water heating.

It seems to me that Mr. Kuli should qualify, to a greater extent, his comment that smaller boilers can be used on these systems. Over here, where we use so much air conditioning, and many times use only coil systems with but a small amount of water, we cannot take advantage of the smaller boilers, since there is little residual storage in such systems.

Apparently, in Europe they almost always use a steam buffer in the top drum of the boiler to absorb the expansion of the water. This does not always work out so well in American design, principally because we prefer to adapt production line boilers to our jobs to save labor costs, and thus many times the buffer space is too small and an auxiliary expansion tank must be used. Most engineers will then use a tank large enough to accommodate all of the expansion. This is probably a matter of local practice. I certainly like the constant pressure condition set up by the steam buffer.

Most American engineers agree that expansion and contraction of the piping is well taken care of by the proper use of pipe bends.—ARTHUR J. HESS, President, Hess, Greiner & Polland, Inc.

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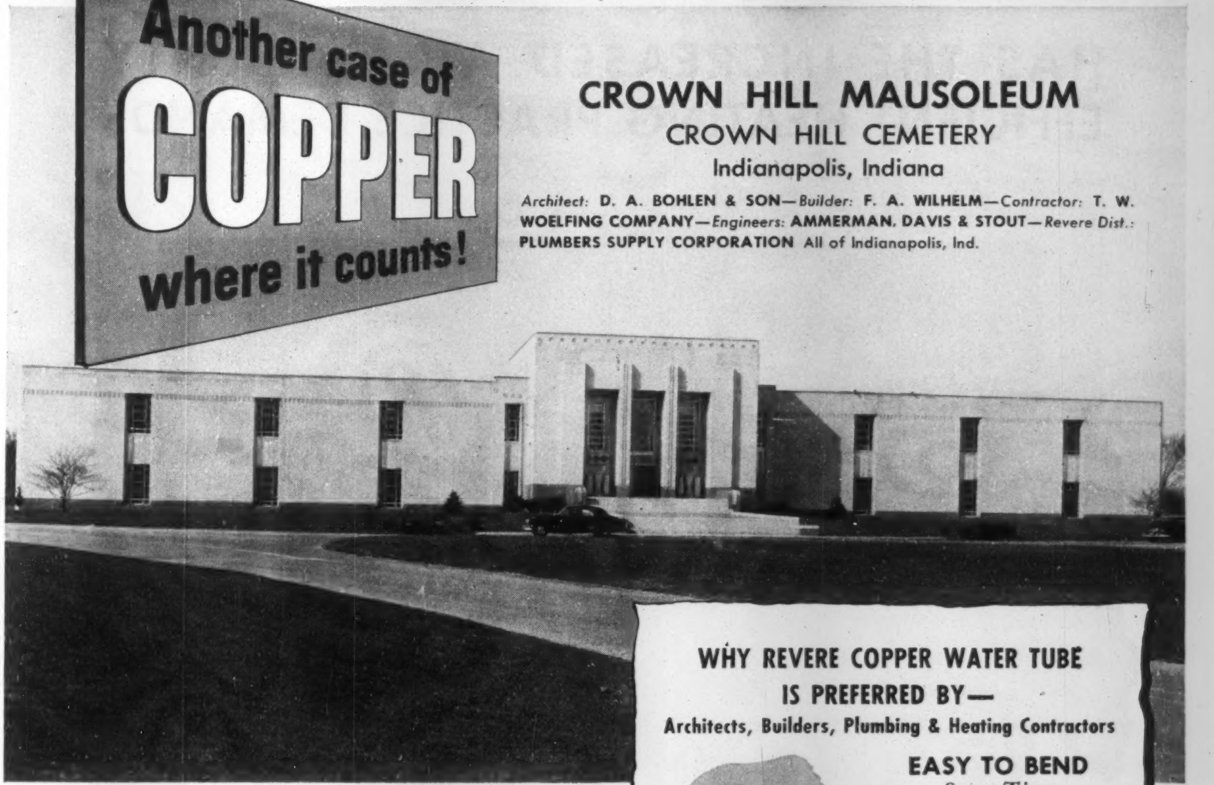
[1] H. F. Schulte, E. C. Hyatt, H. S. Jordan, and R. N. Mitchell, Industrial Hygiene Group, Los Alamos Scientific Laboratory, Los Alamos, N. M.



CROWN HILL MAUSOLEUM

CROWN HILL CEMETERY

Indianapolis, Indiana

Architect: **D. A. BOHLEN & SON**—*Builder:* **F. A. WILHELM**—*Contractor:* **T. W. WOELFING COMPANY**—*Engineers:* **AMMERMAN, DAVIS & STOUT**—*Revere Dist.:* **PLUMBERS SUPPLY CORPORATION** All of Indianapolis, Ind.

Here is a most unusual application of Revere Copper Water Tube . . . as vent lines for the individual crypts in the Crown Hill Mausoleum. Copper Tube was selected because of its enduring, non-rusting qualities and because of the large number of joints necessary in this installation. With copper tube, solder joints were made in a jiffy. Laborious, time-consuming caulking, thread-cutting, wrench work and tedious fitting were eliminated.

Approximately 13,100 lbs. (7,500 ft.) of two-inch Type "L" Revere Copper Water Tube in Soft Temper and in 20-foot lengths was specified. There was also over 1,000 lbs. of Revere Sheet Copper used for flashing this building.

A glance at the panel on the right will tell you briefly why Revere Copper Water Tube is preferred, whether it be for vent lines, waste stack lines, radiant panel heating, air conditioning, hot and cold water lines, underground service lines or processing lines. There is plenty of copper these days so you don't have to skimp or substitute. Using copper is a good way to keep out of trouble. Trouble can be far more costly than copper. Should you need help on technical problems let us know and we'll put you in touch with Revere's Technical Advisory Service. No obligation.

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Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.

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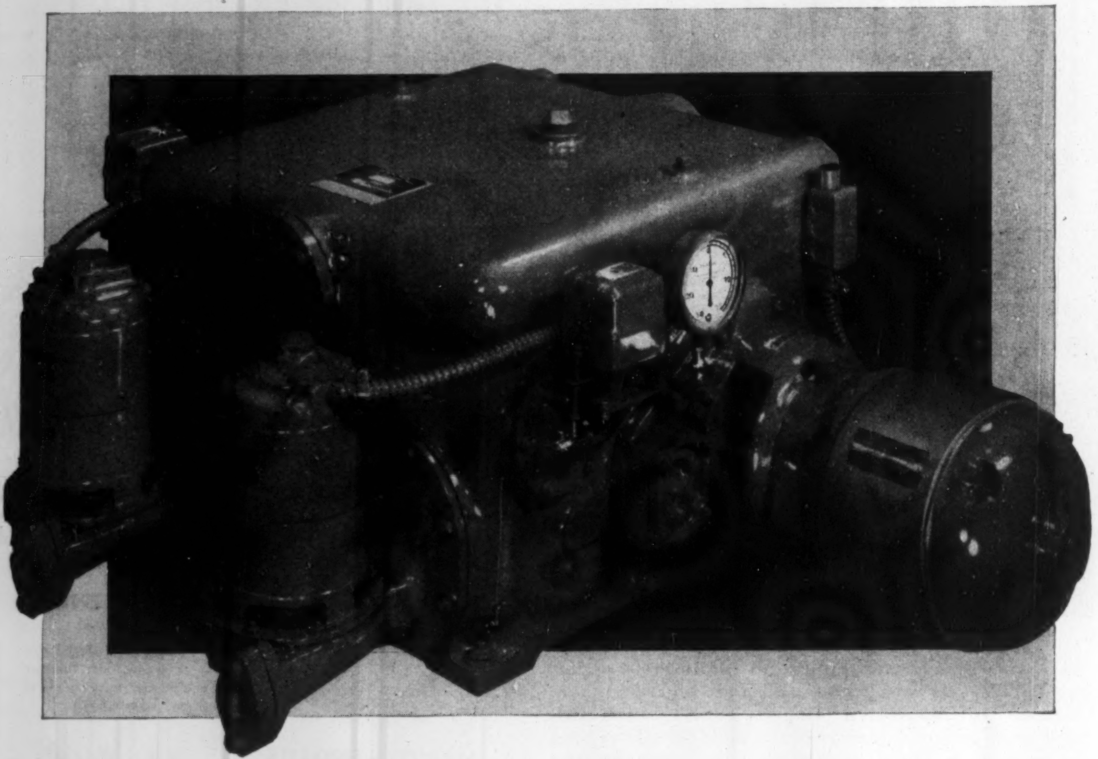
Need Less Work Room . . . Save Metal

No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.

THIS NEW VACUUM HEATING PUMP
HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

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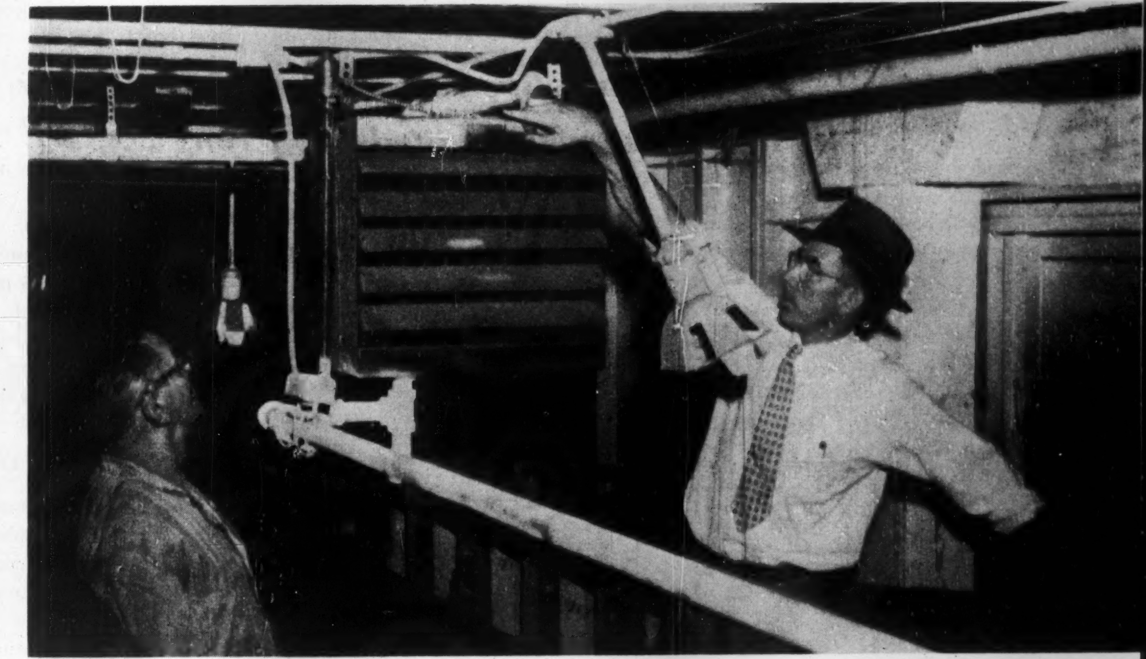


"SOME PEOPLE, suspecting valve trouble, try to cure it by hitting the valve with a stick."

What You Should Know About

Venting Unit Heaters

By Henry H. Aronson
Chief Application Engineer
Heating Div., The Dole Valve Co.

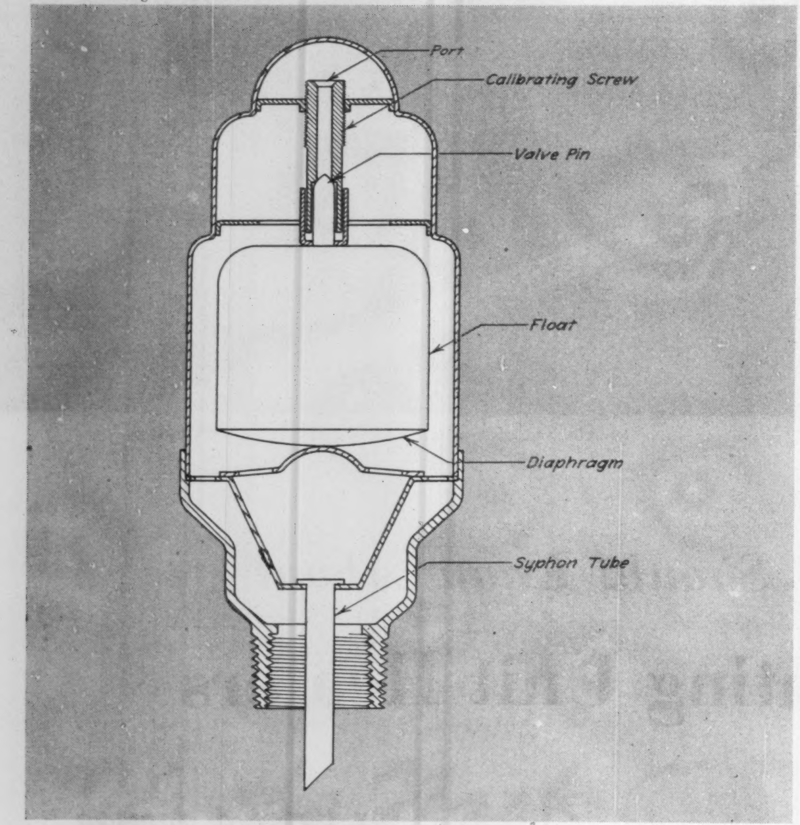
• Unit heaters in low pressure steam systems show excellent results when correctly installed and operated. One key to continuously satisfactory operation is proper venting through air valves. How this should be done is discussed here, with a few tips for installing heaters correctly.

VENTING IS ALL IMPORTANT when unit heaters are used on low pressure gravity steam systems. Everything can be perfect in the system, but if the venting is improper, results will be unsatisfactory.

The correct use of air vents is sometimes misunderstood. When this is the case, trouble is the result. Often the vents are suspected of being defective and are replaced. But this does no good if the basic causes of the trouble are not determined and corrected.

In some ways, air vents are like

". . . Air vents are like fuses. Their failure may indicate that something else is wrong . . ."



1 AIR VALVE OPERATION is basically simple—see text, right. Excessively high pressure can blow the valve shut. Also, if the heater floods and the valve fills with water, the float will close the port

fuses. Their failure may indicate that something else is wrong. Replacing them may permit operation for a while, but when the same fault again appears, the same difficulty will occur. Because air valve failure is mainly symptomatic and seldom causative, there are some things that should be understood about their operation.

Don't Vent Too Fast, Too Slow

Venting unit heaters too fast can cause trouble, especially if the returns are too small or if they are restricted by dirt or scale. If the condensation rate is rapid, condensate will accumulate faster than the returns can handle it. For the same reason, it sometimes happens that when several unit heaters are operated from a single thermostat or control, condensate may be produced faster than the lines can handle it. By controlling the unit heaters so that only one goes on at a time, with just a short period between their starting, this problem can be minimized.

If the air valve vents too fast, steam will enter the unit too quickly. If it vents too slow, a partial vacuum may develop.

A section through a typical air valve of the type used on unit heaters is shown in Fig. 1.

How the Air Valve Operates

Basically, the operation of an air valve is quite simple. Air passes through the nipple, into the shell, through the valve and out through the port.

The float contains a volatile liquid. When steam comes in contact with the float, this liquid vaporizes and expands. This expansion forces the diaphragm — on the bottom of the float — outward. This diaphragm is forced against the base, raising the float and valve pin. The pin is forced into the valve seat, closing the port. Any steam that condenses within the shell returns to the system when the level of water in the valve reaches the syphon tube opening.

Excessively high pressures can also blow the valve shut. Lesser pressures can hold the valve closed after it has been closed thermally. Very often airbound unit heaters are caused by pressure closure of the valve. The remedy is to lower the operating pressure and/or increase the differential on the pressure control. This will enable the valve to cycle oftener.

If the valve should fill with water due to the heater flooding, the float will raise and close the port. Should this happen, it is an indication that something is wrong with the system and this action of the valve is purely an emergency feature.

Leaking, spurting, or sticking of the valve is usually only a symptom of some basic difficulty within the heating system. When these difficulties are corrected, air valve action will become normal, unless the valve has been damaged because of abnormal operation to which it has been subjected.

What Causes Valve to Spurt?

A valve will not spurt water unless water gets into the valve in the first place. This in itself is abnormal and indicates something wrong which must be corrected. The float in an air valve of this type is not made for continuous operation. It is there so that in an emergency it will close off and prevent serious flooding. As the water rises it carries the float and closes the valve. But there is a small amount of inertia so that some water will get past the valve before it closes.

With water in the line, there is often quite a bit of surging. This opens and closes the valve intermittently and more or less pumps a certain amount of water through the valve as long as the surging continues. If the surge is sufficient to produce water hammer, the valve may be ruined.

It is more than likely that the water will also carry grease, dirt, or scale into the valve. If this lodges in the port, the valve will either leak or stick from then on.

Spitting is due to condensation taking place in a fast moving air stream. The condensation is mixed with the air. The temperature of the mixture is too low to close the valve thermally and there is no water column to lift the float. This spitting occurs just before dry steam reaches the valve and closes it. The cause is usually excess pressure or too fast an air valve.

Dirt the Greatest Enemy

The greatest enemy of air valves is dirt and most true air valve failures are due to dirt, scale, or corrosion of the valves. Particles of dirt or scale can get lodged in the seat and cause it to leak or stick. Also, scale or other hard material may score the valve pin or seat so that a tight closure is impossible.

Many other problems are associated with the air valves, because the symptoms indicating some of the common unit heater troubles appear at the valve. This is borne out by the fact that the vast majority of air valves returned to manufacturers as defective will operate as intended when they are tested.

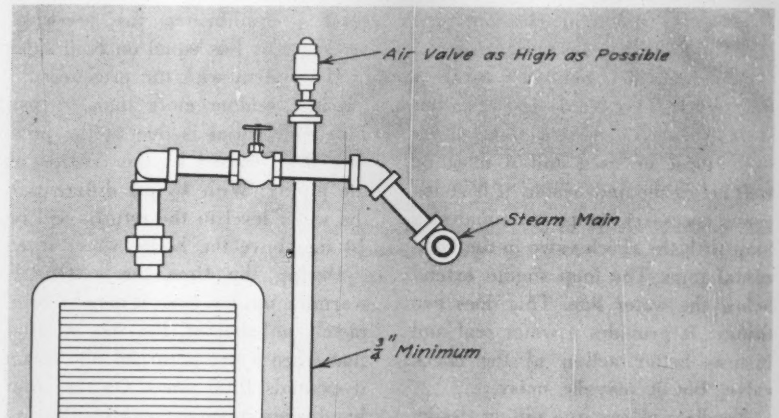
Of valves that are actually inoperative, most of them are either dirty or have been physically damaged. It seems that some people, suspecting valve trouble, try to cure it by hitting the valve with a stick. While valves are not fragile, they are precision devices and hitting them may knock them out of line or put dents in them that will cause the float to bind. Air valves of reputable manufacturers are so well made, and test procedures so well worked out, that the chance of an actually defective valve reaching the field is slight.

Tips on Installing Heaters

With reasonable care, unit heaters will give excellent service on steam systems, and air valves will provide little or no difficulty if these few simple facts are kept in mind.

However, for good results, certain fundamentals must be observed in making the installation. One acceptable method of installing a unit heater is shown in Fig. 2. In using this method, one should bear in mind the following factors:

a) The unit heater should be as


Air Valve as High as Possible
Steam Main
¾" Minimum
Dirt Trap
Check Valve Below Boiler Water Line
Wet Return
Unit heater should be at least 30" above water line of boiler

2 ILLUSTRATED is one method of installing a unit heater. The air valve should be as high above the unit as possible.

> ***". . . Correct piping design with proper venting helps to prevent flooding . . ."***

high as possible above the water line of the boiler, and never less than 30 in.

b) The check valve should be below the water line of the boiler and in a horizontal pipe.
c) The air valve should be as high above the unit as possible.
d) The larger the pipe leading to the air valve the better. It is advisable to use a regular tee and make this pipe the same size as the riser. In no case should it be less than ¾ in.
e) The connection should be made a few inches below the heater and a full 6 in. cleanout pipe should drop below it.

Sometimes it is necessary to use a dry return. This is not desirable, but if it is unavoidable, a tight check valve must be used and it must be well below the unit heater. It is sometimes necessary to use an equalizing loop with the check valve in the horizontal pipe. The loop should extend below the water line. This does two things: it provides a water seal and insures better action of the check valve, but it may be noisy.

Needless to say, the piping design must be basically correct. If the piping is too small, the units improperly sized or installed, or poor piping practices are followed, the system will be inefficient and not operate as intended.

What Flooding Indicates

The most usual causes of unit heater troubles from other than basic design defects, stem from excess pressures, or small or obstructed returns. A common complaint of unit heater operation is flooding. This prevents proper heat release from the heater, and the usual symptom of this difficulty is that the air valves will leak and spurt steam and water. This usually leads to the erroneous conclusion that the air valve itself is faulty.

When flooding occurs, it is an indication of something inherently wrong in the system. The most common causes of flooding are:

a) Excessive pressures,
b) Check valve too close to unit,
c) Unit too close to boiler water line,
d) Undersized returns,
e) Obstructed returns and
f) Sticking check valve.

First, remember that a pressure of 1 psi will raise a column of water 28 in. In a boiler, pressure is exerted equally in all directions. Force is exerted to back water up in the returns as well as to force steam into the mains. When a system reaches equilibrium, the pressures are more or less equal on both sides of the system with the pressure differential seldom more than ½ psi. This differential is due to the pressure drop caused by the friction of the piping. With ½ psi differential, the water level in the returns will be 14 in. above the boiler water level.

During the time the system is warming up, however, it may be completely unbalanced. Bearing in mind that when water is turned into steam it expands 1600 times. On the other hand when steam enters a condensing unit, it shrinks to 1/1600th of its volume upon condensation. In a closed system this will produce a vacuum. However, with open air valves the unit heater will remain under atmospheric pressure. When this occurs, the system is unbalanced and the return system is under the full boiler pressure. Condensation may take place so rapidly in the unit heater that it has no pressure at all.

Under these conditions, a boiler pressure of 2 psi will tend to raise the water in the returns 56 in. above the boiler water level, while 3 psi will tend to raise it 84 in. The check valve is used to prevent the water from doing this. However, it must be realized that the check valve will not open until the head of water above it is sufficiently high to overcome the pressure below it, plus the head — about 4 in. — necessary to operate the check valve. The water will accumulate above the valve. The lower the check valve, the more storage space there will be for condensate.

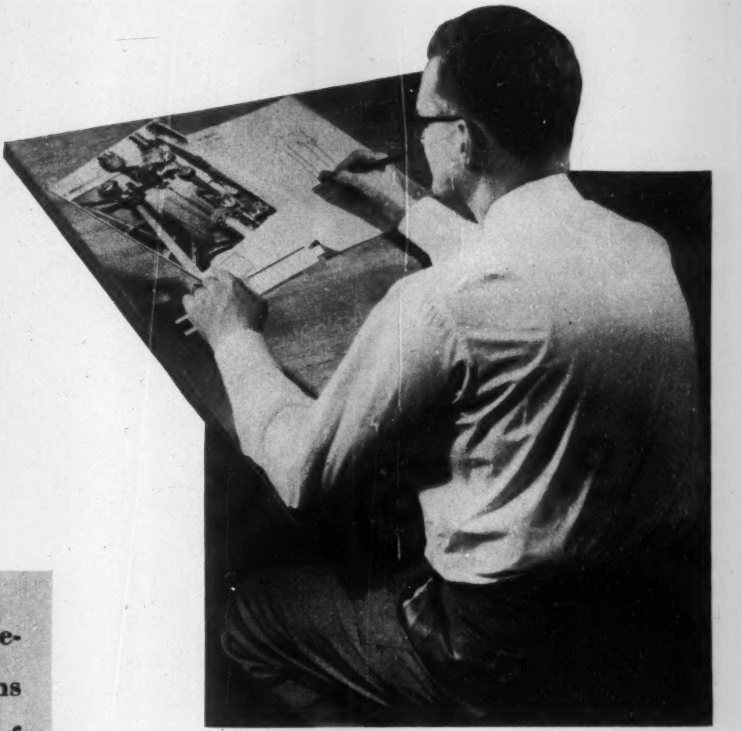
In a properly operating and well designed system, equilibrium will be reached before the unit, the drip line, and the air valve become flooded. If it does flood, something is wrong, as mentioned previously. It should also be remembered that when water fills the returns, the boiler water level drops. If an automatic fill is used and the system is unbalanced for an extended period of time, the boiler itself may be flooded.

It is apparent that these problems stem from an inability to return the condensate properly.

Keep Pressures Low

In operating unit heaters on one pipe steam systems, pressures should be as low as possible and operation should be as nearly continuous as practical. Evidently this pressure concept is often misunderstood because of the widespread belief that heat can be forced around a system faster and farther with higher pressures. With cold heaters and a head of steam this is sometimes true but when the system is once filled, the only benefit is a slightly higher steam temperature. Since the important heat emission is directly attributed to the condensation rate, the steam temperature has relatively little significance, especially as the latent heat decreases with pressure. This refers to low pressure gravity operations and not high pressure systems, which are entirely different. However, the pressures can be a big factor in poor air valve operation. Generally, inability to provide proper heating with low pressures indicates an undersized heater.

Under most conditions, 2 or 3 psi should be an adequate operation pressure. Occasionally 5 psi may be needed where runs are exceptionally long and exposed. In all cases, the height of the unit heaters above the water line, the capacity of the returns, and the steam condensing ability of the system will determine the maximum pressure that can be satisfactorily maintained.



A SIMPLE FLASH shot of piping to be changed can be used as reference material and saves considerable time — only the necessary changes need be drawn. A transparent overlay showing piping changes is made and fastened over the print

• **By combining photo enlargements of existing installations with pencil drawing overlays of changes to be made in a system, both time and money can be saved — as in the cases cited.**

Cut Piping Modification Costs

. . . by using photography in preparing details and plans

THE USE OF PHOTOGRAPHS in place of engineering drawings has speeded up engineering work by making less expensive but fully accurate records, according to the General Aniline & Film Corp.

In some cases, the photographs can replace the engineering drawings; in other situations this replacement is not practical, but photographs can usually be used to supplement these drawings.

In practical use, photographic prints have proved not only cheaper, but faster and easier than making engineering drawings. In addition, the resultant prints are more adaptable to certain uses, for the prints show the plant equipment clearly, and exactly as it is seen. For example, the use of such photographs permits unskilled labor to do routine assembly, disassembly and alteration operations which formerly required employees with the ability to read engineering drawings, or constant supervision.

Save $1250 on Piping Overhaul

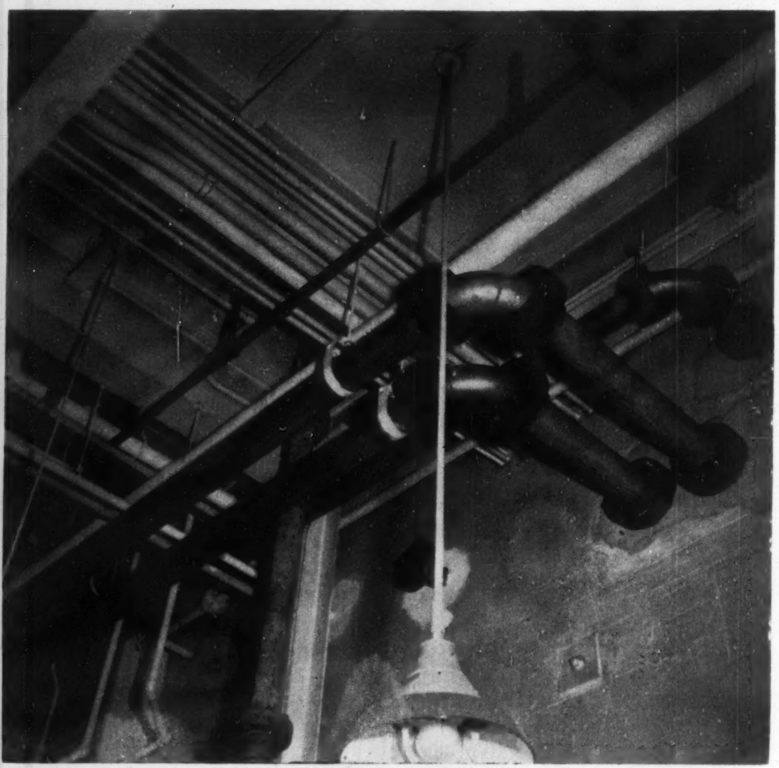
A typical example is shown in the accompanying photographs. The problem involved the annual overhaul of a complicated factory piping system which had to be taken down, cleaned and reassembled, incorporating several piping changes. This job had previously cost the factory approximately $25,000 and a sizable portion of this sum was spent in the weeks of engineering labor over the drafting boards.

In adopting the use of photographs in place of engineering drawings for this work, it was discovered that, instead of weeks of engineering time, the entire installation was photographed by the plant photographer in approximately three days. The resultant cost of this aspect of the work dropped from the previous 6 percent to 7 percent of the total cost of the job, when engineering drawings were used, to 1 percent to 2 percent of the total cost, when photographs were used.

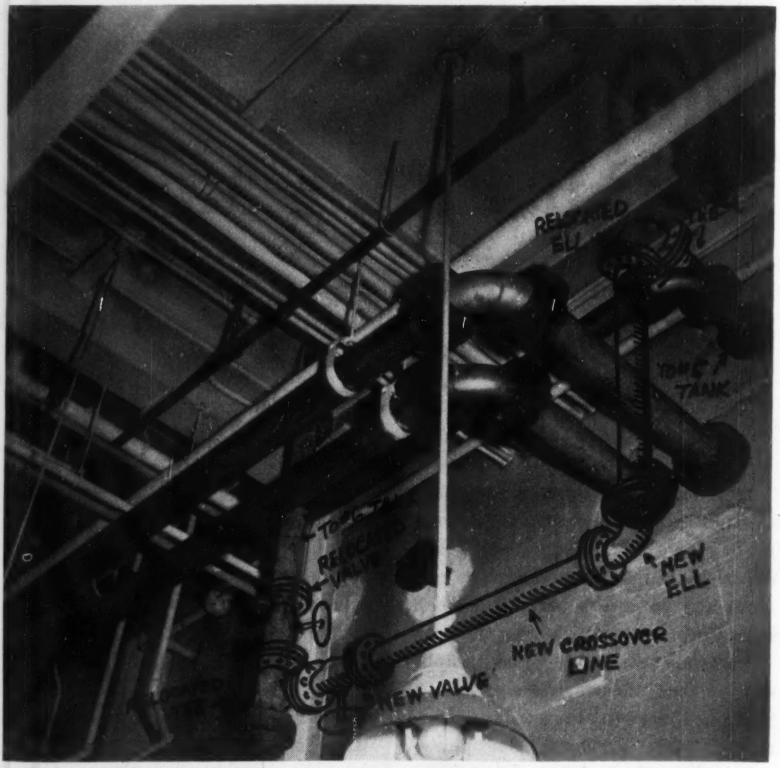
Even in a relatively small industrial job involving $25,000 the use of photography saved about $1250 for that single job. Beside the savings in money, the savings in time may be of even greater importance; the time consumed for the initial phase of the overhaul job dropped from weeks to days.

How Photos Were Used

The following method was used. The entire piping system was photographed, the best views were chosen, and three sets of 11 x 14 in. glossy enlargements were made. One of the three sets was used in the planning conferences, and drawings of the changes to be made were produced on drafting paper. Substantial savings in time were effected at this step, for the draftsmen were required to draw only the changes to be made; reference to the photographic prints made further work unnecessary.



ALTERATIONS IN THIS piping system were necessary, so an ordinary flash photograph was taken



THE NEW CROSSOVER LINE and fittings were then added to show what was to be done

The pencil drawings were made to be reproduced as transparent overlays for the photographs, so three of these "foils" were made of each drawing in a matter of seconds by the Ozalid process. The changes were easy to read, and the photographs were readily examined through the transparent base.

The second set was used by the workmen actually on the job, and the third set was placed in the engineering file.

Using this method, the costly skilled supervision required was reduced. In small operations it would be possible to use photographic prints with transparent overlays attached to them with notations of the changes to be made written in grease pencil.

For one part of the job, it was necessary to make engineering drawings of a large waste pipe system. Much of this system could not be inspected by the plant engineers, except at infrequent shutdown periods, and on weekends. Since this area of the plant was operating around the clock, the time that engineers were able to view the pipes to be overhauled was limited to a few hours on weekends. This short time was spent to best advantage by photographing the vital points.

Accurate records were quickly made through photography, and about 100 photographs were taken. The master drawings were then made by reference to 8 x 10 in. prints made from the negatives and copies of the original drawings. This eliminated many weekend hours of engineering work, with a consequent saving.

Simple Photo Technique Used

Concerning the photographic technique used, the photographer found it convenient to use a small hand camera, in this case the Ansco automatic reflex. This camera has a coated 3.5 lens with ample speed and a great depth of field. Using a lens of short focal length has advantages, since it permits maximum sharpness in both foreground and background areas, even when the picture has considerable depth. Of course, a press type camera with a short focal length lens could be used, possibly with even greater effectiveness.

High speed press type films are unnecessary, and in the case of very small negatives, undesirable. Ansco Supreme 120 roll film was used in the automatic reflex camera. Negatives made on this film gave extremely sharp 11 x 14 in. enlargements from the 2¼ in. square negatives. A fine grain panchromatic film is highly satisfactory and provides sharp enlargements from small negatives.

Flash illumination, rather than flood lighting, was used to eliminate wiring problems and save time. Of course, where electrical outlets are convenient, flood lighting would be slightly cheaper if the time spent photographing the job were not a major factor.

No special processing is required. This use of pictures means that time and money can be saved by using photographs as engineering drawings, particularly in combination with drawings.

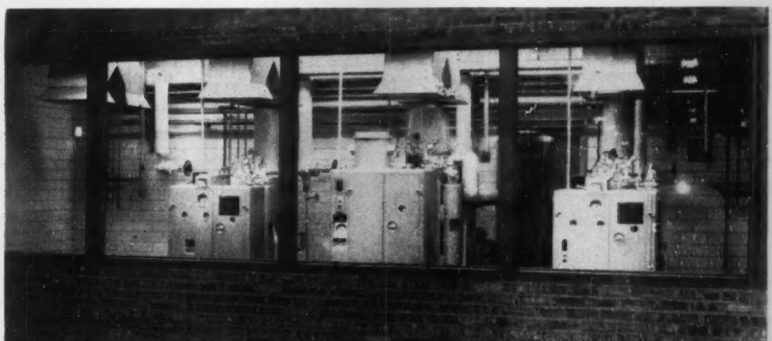
How One Company Saves on Heating

. . . utilizes steam from test generators

VAPOR HEATING CORP., of Chicago, maker of train heating systems, steam generators, mercury thermostats and electronic controls for jet planes, obtains steam to heat its new plant during the day, and 200 psi pressure for manufacturing operations, from newly assembled steam generators that are being tested before shipment.

At night, the plant is heated by steam from one or more of the three similar generators in a glassed-in display room. Unit heaters in the factory are suspended from the roof.

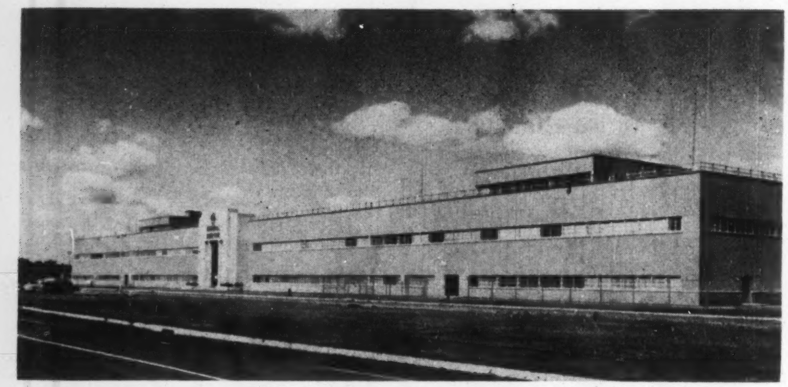
To supply 100,000 gal of water used daily, the company installed a 12 in. pipe 7000 ft from the pumping station. For fire protection, a 250,000 gal water tank feeds the sprinkling system in the plant and a 6 in. fire water line around the building. The tank is kept from freezing by one of the company's automatic steam generators in the pump house.



SHOWROOM GENERATORS, for display by day, go to work by night to heat plant

One of the interesting plant layout problems was how to handle the 300 ft lengths of steel pipe for steam generator coils without obstructing other manufacturing operations. This was solved with a 5 ft high tunnel running crossways under the floor and extending beyond the building.

As each 24 ft piece of steel pipe is electrically butt welded, a friction drive machine pushes the long pipe into the tunnel. The welded pipe, 250 to 300 ft long, is then ready to be drawn out of the tunnel as it is cold rolled into a coil.



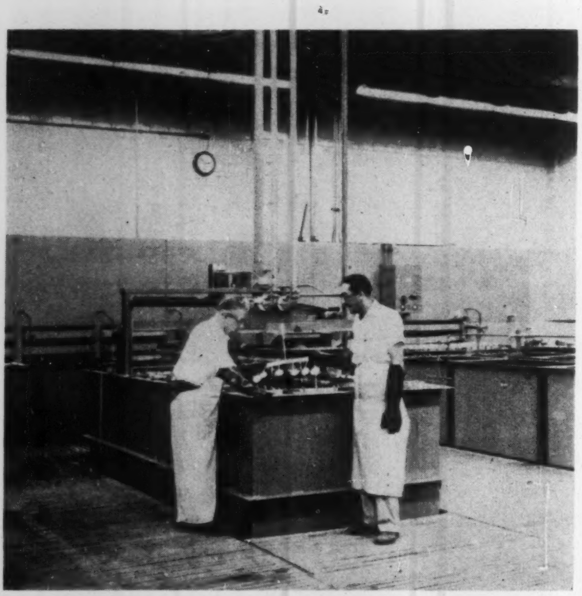
PENTHOUSES in this new plant are used to house ventilating, heating equipment

GENERAL
ELECTRIC

PLANT ENTRANCE. Windows are only in office, laboratory

Today and

. . . in the fast moving field
the plant environment



"SAFETY DESIGNED" plating room, with floor inset tanks, has cement-asbestos board baffles along rear wall

THE EARLY 1950's are going down in history for the large number of modern industrial plants constructed. Among the most recent of these is the General Electric Co.'s new military electronics plant at Utica, N. Y.

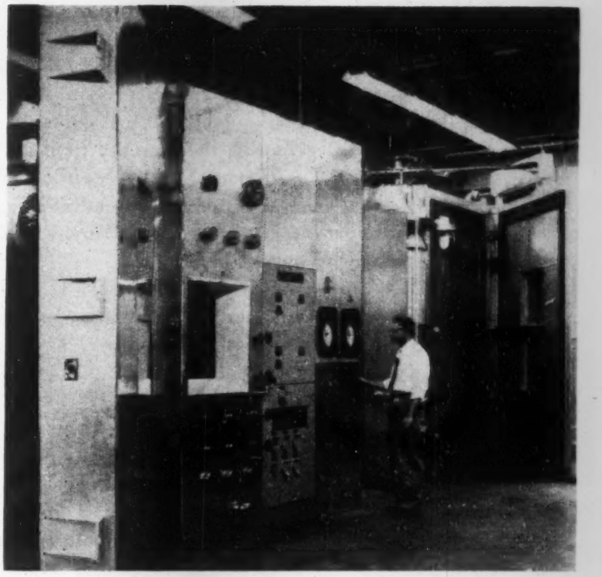
Integrating research, development and manufacturing operations in an economically, yet attractively, constructed building, this plant has facilities which are said to be unsurpassed in scope and flexibility anywhere in the electronics industry.

In operation for about a year, the plant's operating experience is extremely satisfactory. Not only does the plant have test and engineering factilities that are unique in completeness and adaptability, but plant details include the latest and most modern methods in ventilating, air conditioning and heating in order to achieve the necessary close tolerances.

Building Construction

The building, a steel frame structure with 372,000 sq ft of floor space, has a single story factory section 842 ft long and 352 ft wide and a two story office and laboratory

• Here's the description of the modern and flexible ventilating, air conditioning and heating systems in the new windowless electronics plant of the General Electric Co. Fans, filters, preheating and reheating coils for the six sections of the plant are installed in separate penthouses on the roof.



CLIMATIC TEST CHAMBERS are equipped with external control instruments and power connections

Tomorrow

of electronics development must be closely controlled.

section 632 ft long and 75 ft wide.

On the factory roof are six penthouses. Four of these contain mechanical equipment for heating, ventilating and air conditioning the general plant; one houses process ventilating equipment for a plating room and another serves the same purpose for a test power house.

Among the facilities in the factory are special climatic test rooms, equipped with room size chambers.

Ventilating, Heating the Plant

The office and laboratory section of the plant are completely air conditioned. While provisions have been made for air conditioning the factory section, the latter is currently served by a tempered air heating and ventilating system. Ventilation is also provided by a separate system for the test power house, the paint spray room and the plating room.

Ventilation loads for the factory were calculated on the basis of a "blackout" building, as there are no windows in this area. The plant is divided into four sections, each served by the equipment in one of the roof penthouses, which extend across the width of the roof. The two middle penthouses, longer by 100 ft than the outer two, also provide space for the office and laboratory air conditioning equipment.

Each factory penthouse contains two fan casings, with 50 hp motor driven fans supplying air at the rate of 65,000 cfm; each fan serves one-eighth of the plant area. Incoming outdoor air passes through a washable type filter, to preheating steam coils of the non-freeze type and then to the fans. Reheating coils are also provided for recirculated air.

Provision has been made for the future installation of electrostatic filters and another set of dry type filters for use during shakedown of the electrostatic units. The system is adjusted for minimum and maximum outdoor air use. Roof fans are provided to act as pressure relief exhaust when 100 percent outdoor air is used during the summer. They also operate automatically to exhaust smoke in case of fire.

There is sufficient room in the fan casings for the installation of spray and cooling coils and the other necessary auxiliary equipment, if air conditioning is desired.

Tempered air for heating and/or ventilating is distributed through ducts and diffusers to the entire factory area. While the exterior load is small, since there are no windows, zone control for wall exposure is provided by booster heating and cooling coils in the ductwork. This system automatically controls the quantity of make-up air, and provision has been made for the extension of the existing control system for future air conditioning.

Doorways, including railroad sidings, entry doors and truck doors are heated by unit blast heaters.

Steam for the heating and ventilating system is supplied at the rate of 25,000 lb per hr from three boilers operating at 125 psi.

Corrosive Fumes Removed

The factory roof penthouse above the plating room houses the ventilating equipment for both the plating room and paint spray room. Exhaust ventilation for the plating room is supplied by three 25 hp motor driven fans, each capable of delivering air at the rate of 44,000 cfm. Two of the fans exhaust fumes from the plating tanks, and the third one exhausts room air. The exhaust ductwork is lined with acid resistant plastic, to protect against corrosion by the plating liquid fumes. Paint spray room exhaust is provided by a water spray system.

Tempered air for the two rooms is supplied by three 40 hp motor driven fans each at the rate of 35,000 cfm. Two fans serve the plating room and the third, the paint spray room. Since more air is removed from the plating room than is supplied, a partial negative pressure is created, causing factory air to leak in. This provides a positive safeguard against the leakage of plating fumes and odors into the factory area.

Ventilation for the test power house is provided by the equipment in the roof penthouse directly above it. The equipment is a 50 hp fan delivering air at the rate of 75,000 cfm. Recirculation control is provided so that only sufficient outside air to keep the room temperature rise to a minimum is mixed with the recirculated air.

The fans in the penthouses are all of the centrifugal, backward curve type.

Safety Designed Plating Room

Although the 120 x 50 ft plating room is not a large installation, great care was taken to make the operation as safe as possible.

The 40 process tanks, arranged in three U's, are 4 ft high and are set into the floor 1 ft. The resulting 36 in. working height keeps the top of the tanks below the operators' breathing zone. Masonry exhaust ducts lined with acid proof brick are provided, with the face of the exhaust hood flush with the back angle of the tank. The exhaust hoods are sheet metal, lined with acid resistant plastic and painted with corrosion resistant paint. The exhaust ducts connect into a vertical stack of red brick, lined with acid brick. Air is exhausted at the rate of 88,000 cfm, and supplied at the rate of 70,000 cfm.

Since the various plating liquids require different neutralizers, they are segregated into four types: acid, alkali, chromate and cyanide. A portable pump is used to empty each tank into batch disposal basins. Rinse tanks are designed to overflow into trenches under the tanks, and the overflow liquids are segregated and carried to the batch disposal basins.

Piping, ducts and utility lines in the plating room are segregated behind a cement-asbestos board baffle so that maintenance can be performed without exposure to the tanks.

Temperature in the tanks is controlled by a thermostat and solenoid that are connected to the tank plate coil. One breaker shuts off all power to the plating tanks, and the water, steam and air supply each have one main control valve.

Air Conditioning Is Dual System

Air conditioning for the laboratory and office is accomplished with a dual system. Interior zones are served by conventional packaged units with ducts and diffusers. The perimeter system consists of window units, each with its own fan, coils, filters, and chilled and hot water lines for each module. In this way each office and laboratory is able to set its own air conditions for both summer and winter.

Special Test Chambers

Climatic test equipment includes two climate chambers with a free inside volume of 12 x 8 x 9 ft and four of 6 x 8 x 7½ ft. Temperatures range from −85 F to 248 F, and relative humidities from 39 to 95 percent. Pressure can be reduced to simulate an altitude up to 100,000 ft. There are additional chambers for temperature and humidity tests only and for special heat tests.

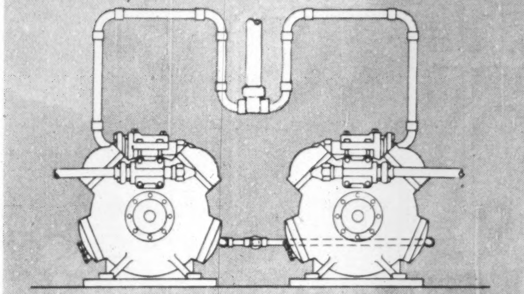
Access to the chambers is obtained through hydraulically controlled doors weighing up to three tons. Progress of the tests can be observed through windows in the chamber wall.

Not only must the assembled electronic units be rigorously tested, but so must materials and component parts. Therefore, the engineering laboratories are equipped with facilities similar to those outlined above for completed units, but scaled down to the needs of the laboratory. Equipment includes climate chambers, humidity chambers, salt fog corrosion cabinets, heating ovens, and subzero cabinets.

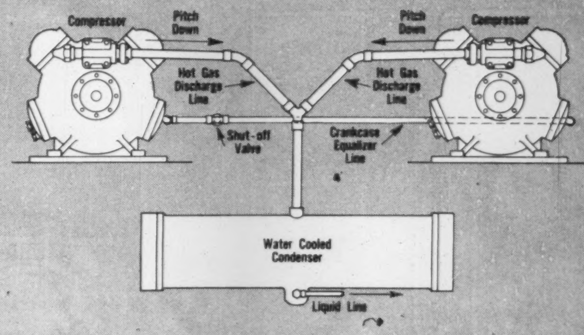
To serve all of the testing areas, the plant has a complete laboratory for calibration and maintenance of all measuring and testing equipment.

With complete and flexible ventilating, heating and air conditioning facilities like these, this plant not only is equipped to serve today's needs in electronics manufacturing but is prepared to meet tomorrow's as well by closely controlling the environment.

The plant was designed and built by Walter Kidde Constructors, Inc.



1 WHEN TWO COMPRESSORS are operating in parallel, the common suction line should enter a trap formed between the compressors



2 WHEN THREE OR MORE compressors are in parallel, individual suction lines should be taken to each compressor from a common horizontal suction manifold

Better Refrigerant Piping for

Parallel Compressor Systems

• Faulty piping is often the cause of failure in parallel compressor refrigerating systems. What happens when suction piping is not correctly designed is discussed here.

By Lincoln R. Scafe

Manager, Service Dept., The Trane Co.

PROPER PROCEDURES in overall refrigeration piping are vitally important. Even though two or more compressors in parallel are properly equalized, there is still a large possibility for failure due to faulty piping procedure.

Trap for Common Suction Line

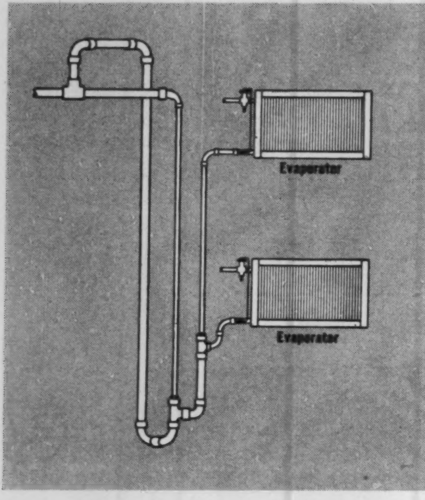
The piping should be arranged so that the oil will return evenly to all the machines in operation.

The suction connection to a multiple compressor system is a typical example. When two compressors are used, the common suction line should enter a trap formed between the two compressors, as shown in Fig 1. The individual suction lines from the trap to the separate compressors should be equal in size and length so that oil will return equally to both machines. The trap, formed in this manner, makes it possible to return the oil equally when both compressors are operating.

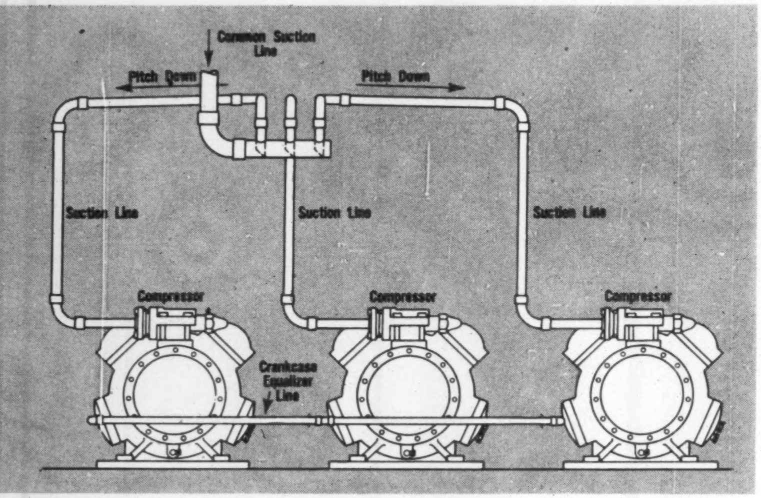
When only one compressor is in operation, the oil is directed to that unit and is prevented from returning to the other.

Piping for Three Compressors

Should three or more compressors be used in parallel, the individual



3 WHERE SUCTION LINES must rise vertically, it is necessary to use properly designed risers to maintain at least 1500 fpm for proper oil return



4 TO PREVENT OIL from flowing back into the idle compressor, a "Y" connection of the type shown here forms the necessary oil trap

suction lines to each compressor should be taken from a common horizontal suction manifold, shown in Fig 2. This method, of course, may also be used successfully with two compressors in parallel.

The manifold should be as short as possible and arranged so that the common suction line will drain into it easily. In this arrangement, the suction lines to each compressor are taken off at the top of the manifold. In making the connection, the end of each line is mitered at a 45 deg angle and projected to the bottom of the manifold. This makes it possible for the operating compressors to pick up the oil, and no oil will flow into the compressor not operating.

If good piping procedure is important in two compressors operating in parallel, it is even more so when three or more machines are used. Additional compressors increase the complications of returning the oil to each machine equally.

Piping for Rest of System

The rest of the suction line also requires careful design. Avoid large volume oil traps. They will collect excessive quantities of oil and rob the compressors during periods of light operation. They also increase the hazard of large volume refrigerant slugs when full operation is resumed. This is particularly important because the more compressors in parallel, the more steps in capacity reduction. The minimum operating load might drop to 10 percent or less.

Thus vertical risers in the suction line, as in Fig. 3, are extremely critical. A minimum velocity of 1500 fpm must be maintained even during minimum load operation. It may even be necessary to use a triple riser to insure the proper oil return. Even better, the system should be designed with all of the evaporators above the level of the compressor in order to avoid vertical risers completely.

Any system which feeds excessive oil to one machine and starves another will cause serious trouble in both. The one receiving the excess oil may be damaged by slugging. The other may fail due to lack of oil. Such damage may occur even though the proper equalizers are used. If for any reason the oil in the system is low, or if part of the oil is trapped in an evaporator, there may not be sufficient oil for the equalizer to function properly.

Dangers in Improper Piping

Here's what might happen when suction piping is not correct.

1) When no oil trap is used in the suction line manifold to two compressors, oil will collect in the suction line of whichever machine is idle. That will cause slugging when the machine returns to operation.

2) When three or more compressors are connected to the bottom of a common suction line, oil will build up in any idle machine and cause slugging when that machine is returned to service.

3) If individual suction line takeoffs from a common suction line below the compressors are designed with oil traps, oil will build up in the trap of an idle machine, causing slugging when the machine returns to service.

Even though some compressors have a large suction chamber to minimize the danger of slugging, it is still necessary to design a system that will produce a minimum amount of slugging.

Hot Gas Lines

It is always good policy in designing a multiple compressor system in parallel to keep the condenser or condensers as close to the compressors as possible. Sometimes, however, this is impossible. Generally, water cooled condensers can be located in close proximity, but evaporative condensers may have to be placed in roof locations far removed from the compressors.

The discharge piping problem increases almost in direct proportion to the distance between condenser and compressor. The two reasons for this increase are:

1) The pressure drop in long discharge lines becomes excessive.

2) The problem of keeping oil moving through the system is greatly increased.

Even though these factors are diametrically opposed, there must be a compromise in which there is sufficient velocity to keep the oil flowing at the expense of increased pressure drop. The added horsepower required for the added pressure drop is the penalty that must be paid to insure proper return of the oil.

When long hot gas lines are required, the following information will prove helpful in designing a satisfactory system.

Condenser Below Compressors

When a single condenser is used below two compressors arranged in parallel, the problem is fairly simple. The oil being pumped out of the compressor is aided by gravity in its flow to the condenser. The sole object in moving the oil to the condenser is to keep it moving through the system so that it can be returned to the compressor. Should there be a single inlet to the condenser, the discharge piping from each compressor should be joined with a "Y" connection, as in Fig. 4. This will prevent gas pulsations from colliding violently as they enter the single line to the condenser. At the same time the "Y" connection will form an oil trap that will prevent oil from pumping back into the idle compressor when only one is in operation.

The first article in this series appeared in the September HPAC. The third will be presented soon.

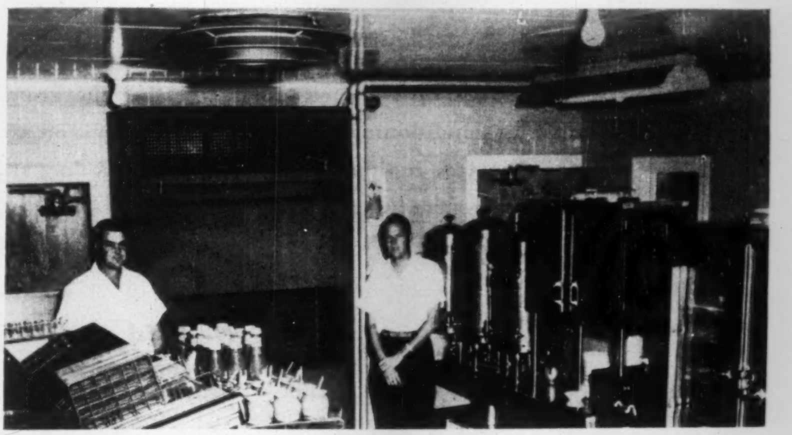
Restaurant Kitchen Air Conditioned

. . . to solve many problems

In relatively few cases has a restaurant kitchen been air conditioned, because the heat load is usually considered too great. An instance of kitchen air conditioning, however, that has worked out to good advantage, according to the Typhoon Air Conditioning Co., is the Howard Johnson restaurant near Fredericksburg, Va.

The dining area of this restaurant had been air conditioned for two summers with a central installation, but because of the unusually high humidity in the area plus the high heat load thrown by the kitchen, the system had not been performing satisfactorily. In addition to cooling the restaurant inadequately, the equipment would frequently kick out, each time requiring someone to push the reset button. Owner H. C. Ovitt called in a local air conditioning contractor, John T. Ellington, to suggest a remedy.

Instead of adding directly to the existing system or replacing it with one that would deliver a greater capacity, it was decided to install two free standing packaged 10 hp units in the kitchen. The stoves, the dishwasher and the bake oven are hooded, with a 5000 cfm direct exhaust fan that aids substantially in reducing the kitchen heat load.

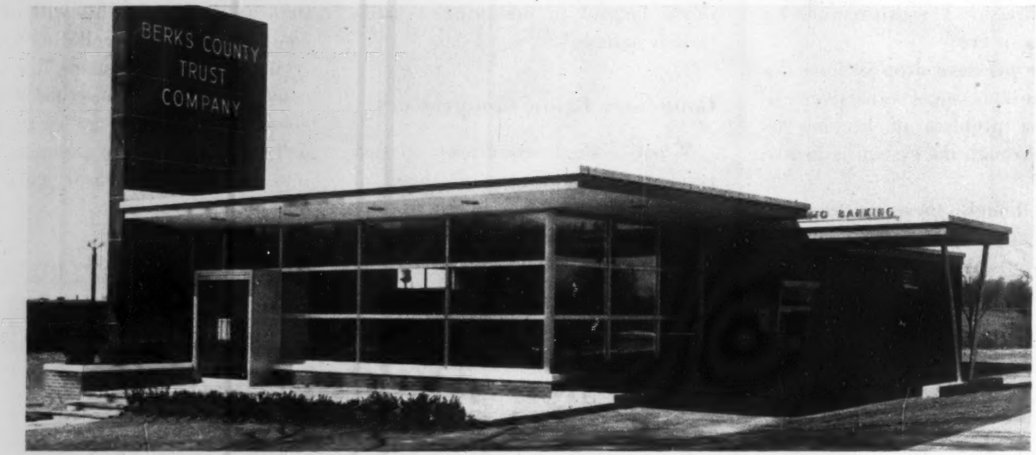

AIR CONDITIONING was installed in this kitchen in spite of the high heat and humidity loads, and as a result, many benefits have been derived.

Results were immediately evident in the dining room, where the central plant, relieved of the kitchen heat load, gave complete satisfaction in even the hottest weather. In addition, the important benefits of kitchen air conditioning became apparent. Turnover in kitchen personnel, which had been a problem in this restaurant, is now virtually eliminated. Waitresses no longer complain about having to walk back and forth between the "tropics" and the "north pole" all day. Moreover, the new system prevents condensate from forming on the glass doors of refrigerated cases — an important point, since the kitchen is open to customer view.

The morale of his kitchen help, says Mr. Ovitt, is up 50 or 60 percent. "I never thought a restaurant kitchen could be air conditioned so effectively," he says, "but I'm certainly glad I found out. The units perform so well that we have to turn them off when we want to raise dough to make bread, so the cool air won't make it fall!"

Heat and Cool Branch Bank

. . . with year 'round air conditioning



1 YEAR 'ROUND air conditioning was installed in this modern branch bank in Pennsylvania this year

• Among the foremost customers creating the growing demand for year 'round air conditioning today are banks. Here is an article telling how loads were estimated, equipment was selected and a duct system was planned for an all year system in a new suburban bank.

By S. W. Reid
Air Conditioning Engineer
Gilbert Associates, Inc.

COOPERATIVE PLANNING between architect and engineer was required to develop the interesting heating and cooling system built into the Riverside office of the Berks County Trust Co., Reading, Pa.

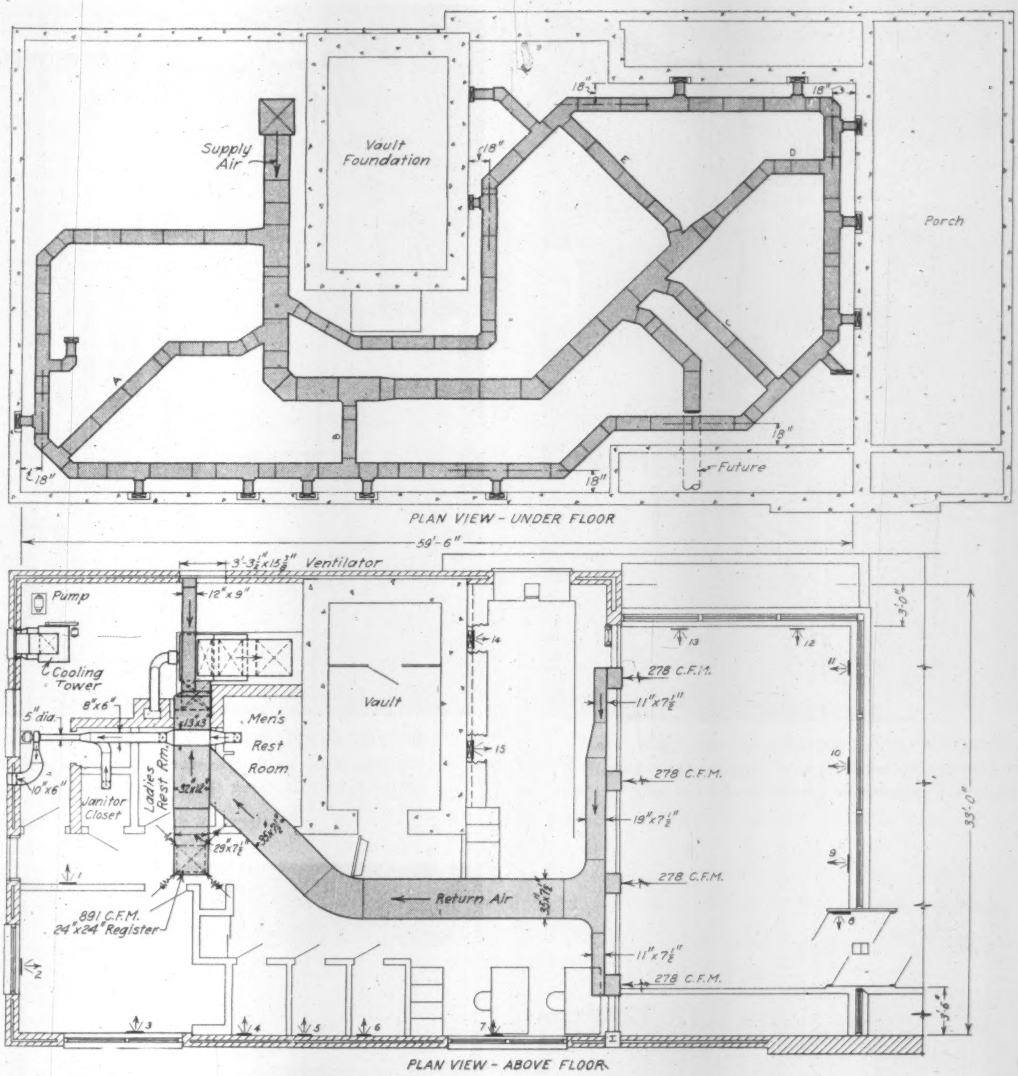
Preliminary architectural designs, influenced by the owner's requirements and by the topography of the site, indicated that an on-grade concrete floor would be desirable. In a small, completely exposed building this is an important factor in planning the heating system because of the possibility of having a cold floor.

A second architectural feature which influenced the heating arrangement was the liberal use of glass. Glass fronts add much to the effectiveness of contemporary design, but they must be treated respectfully by the heating engineer if window sweating and cold downdrafts are to be avoided.

Perimeter Loop System Chosen

Another critical area was along the south wall, where the possible effects of cold walls had to be counteracted. Coupon booths and desks are located here. Sustained occupancy without proper heat distribution could have resulted in discomfort due to the radiation of body heat to the wall.

It was decided that a perimeter loop duct system imbedded in the floor slab would meet the specific requirements for this installation. Fig. 2 shows the layout. As warm air flows to the registers from the conditioner in the utility room, it gives up a certain amount of its heat to the floor slab, thereby preventing the undesirable cold floor. Perimeter baseboard type registers diffuse the air upward along all outside walls,


Supply Air
Vault Foundation
Porch
A
B
C
D
E
18"
18"
18"
18"
18"
18"
Future
PLAN VIEW - UNDER FLOOR
59'-6"
3'-3½"x15⅜" Ventilator
12"x9"
Pump
Cooling Tower
8"x6"
5" dia.
10"x6"
Janitor Closet
Ladies Rest Rm.
Men's Rest Room
13"x3"
32"x12"
29"x7½"
35"x7½"
35"x7½"
891 C.F.M. 24"x24" Register
Vault
Return Air
278 C.F.M.
11"x7½"
278 C.F.M.
19"x7½"
278 C.F.M.
11"x7½"
278 C.F.M.
3'-0"
33'-0"
3'-6"
1
2
3
4
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14
15
PLAN VIEW - ABOVE FLOOR

2 SUB-FLOOR duct and overhead return and ventilation systems. Return duct is concealed above ceiling

counteracting the natural cold downdrafts.

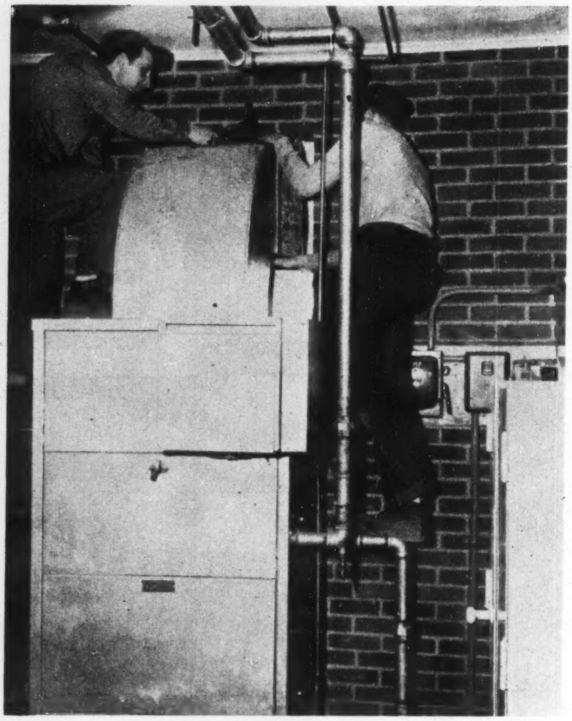
The problem of returning air to the conditioner was solved by taking advantage of the architectural plan to use suspended ceilings and to have the ceiling level in the lobby higher than that in the remainder of the building. Fig. 2 shows the return air duct which was concealed above the ceiling and Fig. 3 shows the architectural treatment employed to successfully blend lobby intakes into surrounding materials. In order that air from the rear areas of the bank would not have to travel to the lobby to enter the return air system, a return air intake was installed in the corridor ceiling.

Estimate Loads and Choose Unit

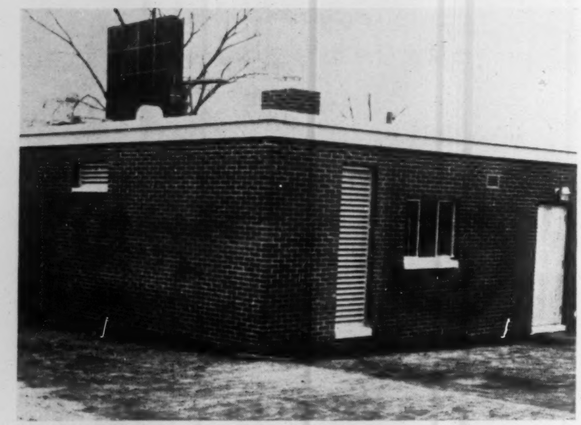
The design of the air conditioning system began with the heating and cooling load estimates. Basic to these were the areas of the various exposed surfaces, *U* values (heat transfer coefficients), and temperature differences between conditioned and unconditioned spaces. It was necessary to estimate infiltration and the amount of outside air that should be brought into the conditioned space. For the cooling load it was further necessary to consider the effect of lights, people, and solar radiation in terms of the amount of heat each would contribute.

The calculation of heating and cooling conduction loads was made in the conventional manner. As shown in Fig. 2, all spaces in the bank are supplied with conditioned air with the exception of the utility room, the vault, and the washrooms. These, plus the janitor's closet, are handled indirectly, conditioned air being pulled through them from the

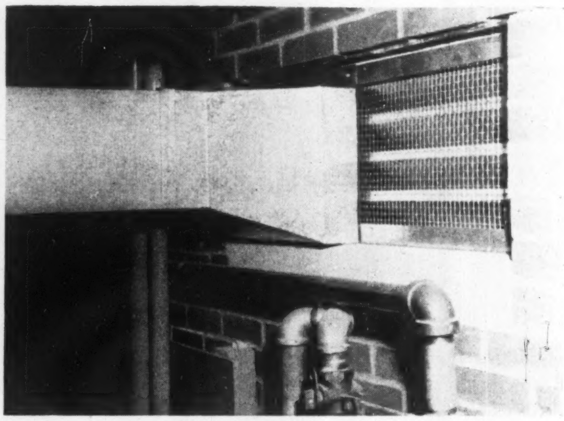
3 RETURN AIR INTAKES in the lobby are blended architecturally with the surroundings. Note how wooden trim crosses intake opening



4 THE COOLING TOWER was installed along the rear wall so that it would not discharge into the path of cars using the drive-in window



5 A SINGLE VERTICAL louver was used for the tower. The smaller, permanently open louver (at left) was installed to admit air for combustion



6 PART OF THE smaller louver is used to obtain outside air for the air conditioning system

corridor by the exhaust system. The vault itself is conditioned only by natural circulation.

The amount of air exhausted was based upon one change per hour for the entire conditioned space and checked to make sure it was adequate to meet the recommended quantity for average peak population and the amount needed to properly ventilate the washrooms.

The total calculated cooling load, based upon 95 F dry bulb, 78 F wet bulb outside and 80 F dry bulb, 67 F wet bulb inside, amounted to 58,328 Btu per hr, made up of 42,338 Btu per hr sensible heat and 15,990 Btu per hr latent heat. The calculated heating load, based upon 0 F outside and 75 F inside, amounted to 83,548 Btu per hr. The cooling load indicates that a unit having approximately 5 tons of cooling capacity would handle the job nicely.

TABLE 1—NORMAL RATINGS of unit chosen

Equipment and Function	Rating
Compressor motor	7½ hp
Blower motor	¾ hp
Heat Output at Bonnet	112,000 Btu per hr
Cfm Heating	1750
Cooling Capacity 80 F dry bulb, 67 F wet bulb air and 110 F condensing temperature	Total 81,400 Btu per hr
Cfm Cooling	2500
Cfm Maximum	3000

TABLE 2—HOW TRUNK duct was sized

Section of Trunk	Future Cfm	Trunk Diameter (in.)	Future Velocity (fpm)	Present Cfm	Present Velocity (fpm)
Plenum to feeder A	3000	18	1700	2500	1430
Feeder A to feeder B	2460	18	1400	1960	1110
Feeder B to 12" feeder	1890	15	1550	1390	1130
12" feeder to feeder C	1390	15	1140	1390	1130
Feeder C to feeders D & E	965	15	800	965	800

Note: Feeder identification letters refer to Fig. 2.

TABLE 3—HOW FEEDERS were sized

Location	Register No.	Internal Sensible Btuh	Cfm	Feeder	Feeder Diameter (in.)	Velocity (fpm)
Corridor	1	3745	240			
Lounge	2	2270	150			
Lounge	3	2270	150			
			540	A	10	980
Office	4	1460	95			
Office	5	1460	95			
Office	6	1460	95			
Office	7	4385	285			
			570	B	10	1050
Lobby	8	2590	170			
Lobby	9	2590	170			
Lobby	½-10	1295	85			
			425	C	10	780
Lobby	½-10	1295	85			
Lobby	11	2590	170			
Lobby	12	2590	170			
			425	D	10	780
Lobby	13	2590	170			
Tellers	14	2850	185			
Tellers	15	2850	185			
			540	E	10	980
Total		38,290	2500			

Note: Register numbers appear on plan, Fig. 2.

At the owner's request, however, the actual selection was one size larger than required to anticipate a possible future enlargement of the public space in the bank.

The packaged year 'round unit chosen contains a vapor compression cooling system and a gas fired heating unit. Nominal ratings of the equipment are summarized in Table 1.

Plan Duct System

Fixing the location of the conditioning unit also fixed the starting point for the sub-floor duct system, which was designed next.

One of the primary considerations regarding the duct system was the choice of materials. Preliminary calculations showed that sizes up to 18 in. in diameter would be needed. Also to be taken into account was the need for moving heavy equipment, including the vault door, over the floor. To meet the requirements, extra strength clay pipe was specified for the trunk, feeders, and loop. Boots were made of galvanized sheet metal as were the overhead return and ventilating systems.

After the registers were located, the next step in the layout was to connect them with the perimeter loop. This worked in very nicely with the exception that it was necessary to bring the loop around the vault, for security reasons, rather than use the more direct underneath route. The loop had to be kept far enough from the front of the vault so that the heavy vault door during installation would not rest on it. Notice in particular (Fig. 2) that the loop was run under the washroom floors to aid in keeping them heated during cold weather.

The final layout step was the running of a trunk duct from the supply plenum at the unit to connect with all the feeders. Take-off sections had to be located so that available angles would line up with the feeders. Take-offs, where possible, were at 60 deg with the line of flow in the trunk to aid in the distribution.

Select Duct Sizes

All registers were numbered and each was assigned its share of the cooling load for the particular space in which it was located. Thus, register 1, being the only one in the corridor, was assigned all of the internal sensible load for that area. Registers 2 and 3 are each in the lounge, so they share equally the internal sensible load for that room, etc.

The registers were grouped and assigned to feeders to establish air quantities from which to determine the size of duct needed.

To size the trunk line the full cooling air quantity of the unit (3000 cfm) was taken into consideration to provide a duct large enough for the anticipated enlargement of the public space. In addition to the five 10 in. feeders (A, B, C, D, and E in Fig. 2) for the present structure, a 12 in. feeder was added to the trunk and blanked off to minimize the amount of floor renovation necessary to extend the duct system into the future section. The present loop duct in this area would be broken and extended to registers around the perimeter of the addition.

The loop was made the same diameter as the largest feeders. It will be noticed that the loop was not considered in sizing the feeders and the trunk. It is not possible to predict what portion of air will reach each register by what route since several routes are open to each. The design method of assuming that all the air moves to the registers via trunk, then feeder, then loop is on the safe side, since actual velocities throughout the system will be somewhat lower than those listed, except those at the very beginning of the trunk.

Construct Duct System

The actual construction of the duct system began as soon as the foundation walls had been poured. The starting place was the entrance plenum, which was poured concrete. The bell of the 18 in. round duct at this point was 5 in. below the top of the floor slab. Joints in the loop were positioned so that they would be about 1½ in. below the top of the slab. Trunk and feeder duct was laid at intermediate elevations as needed.

The ground underneath the duct work was covered to a depth of at least 6 in. with coarse stone. On top of this was spread a layer of 55 lb roofing felt with joints and required holes thoroughly cemented to make them watertight. On top of the felt was spread a layer of sand, sufficient to cradle the duct. After the duct system was installed, the remainder of the floor area was covered with roofing paper to serve as a moisture barrier in the same way as the material used under the duct. Reinforcing mesh was laid over the entire area before the concrete floor slab was poured.

One inch of rigid glass fiber insulation, extended to a depth of 24 in., was used around the edge of the slab where it joins the foundation wall. The same material was used to insulate the sheet metal boots from the wall. For concealment, the edge of the insulation was kept about 1 in. below the finished floor line.

Heating, Cooling Thermostat

The conditioning unit is controlled by a combination thermostat and change-over switch. The instrument is mounted on the wall at the rear of the office space.

In operation, a single thermostat serves for both heating and cooling by energizing a double-pole, double-throw relay mounted in the conditioner. A fall in temperature causes the thermostat contacts to close to energize the relay. This opens the cooling control circuit and closes the heating control circuit.

The manual switch mounted with the thermostat operates remotely a change-over damper which directs air either over the heating unit or through the cooling coil. A switching arrangement tied in with the damper permits the unit to supply either warm or cool air in response to the demands of the thermostat. For example, when the thermostat is set for 75 F and the room temperature is 73 F, the thermostat contacts will be closed and the relay energized. This will close the heating control contacts and open the cooling control contacts in the relay. If the change-over switch has set the damper in the heating position, the heating control circuit will be completed and combustion will continue until the room temperature rises above 75 F. If, however, the change-over switch has set the damper in the cooling position, the relay will serve only to prevent the cooling unit (compressor) from operating until the room temperature somehow rises to 75 F, causing the thermostat contacts to open and de-energize the relay coil.

The conditioning system was put into operation in early spring during intermediate weather that required some heating early in the day and some cooling toward mid-afternoon. It was not possible to obtain any conclusive operating data with regard to temperatures because of the reservoir characteristics of the duct system and slab.

Unusual Heat Pump Installation

. . . serves shoe factory

SEVENTEEN packaged air source heat pumps — with a total installed cooling capacity of 85 tons — provide automatic heating and cooling in what may be the first truly all electric factory in the world, says the General Electric Co.

The 17 five-ton units are employed by the Virginia Shoe Co. to electrically heat and cool its new plant in historic Fredericksburg, Va. This company is housed in a one story insulated cinder block building, in which production, assembly, and office areas total more than 25,000 sq ft. The company employs about 300 people.

In addition to employee comfort and morale, maintaining a constant temperature and an even level of relative humidity is especially important in shoe manufacture. Hides used in shoes are easier to work in a controlled atmosphere and a product of more consistent quality is possible.

Automatic Zone Control

Individual zone control was necessary throughout the plant. Resistance heaters with individual capacities of 29 kw are used for gluing and drying operations and some 132 fractional horsepower motors are used on the company's machines. To meet the varying heating and cooling requirements imposed by this equipment, each heat pump has its own thermostatic controls to automatically adjust its performance to the actual needs of the area it serves.

The air conditioning was designed on the basis of 95 F dry bulb and 78 F wet bulb.

In winter, air source heat pumps extract heat from this outdoor air, pumping it into the building being heated. In summer, they reverse themselves automatically, extracting heat from indoor air and pumping it outside. No water is used.

QUESTION OF THE MONTH

What's the Cost of Snow Melting?

• *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*

THE QUESTION asking for cost data on sidewalk snow melting was published previously in HPAC and is repeated here for information along with an answer to the question that has been received from one of HPAC's readers. Other comments on this subject will also be welcome.

"I am most interested in obtaining any data available on the cost of installing and operating sidewalk snow melting coils. We are giving preliminary consideration to snow melting for the sidewalks on two sides of our office building.

"If available, I'd like to get some figures on costs using water or an antifreeze compound circulated in pipe coils embedded in the concrete, as well as by electrically heating the sidewalk."

A. J. BREUGELMANS —

"Here's How To Figure Cost of Snow Melting"

THE INSTALLATION cost of heating panels or coils in concrete sidewalks for snow melting generally runs between $1.25 and $3.50 per sq ft. The first cost is dependent upon the size of the coils and the type (grid, sinuous, etc.). Cost of operation of panels for snow removal averages 17c per 1000 sq ft per hr.

The initial decision to make is the amount of snow desired to be removed or melted in an hour. This figure can be arrived at by use of Weather Bureau data which has shown that over a period of years the majority of snowfalls average 1 in. to 1½ in. per hr and at an average temperature of 25 F. Experience under varying circumstances indicates that a coil design based on a snowfall of 1 in. per hr is of sufficient size.

The following formula is used for determining the amount of heat required: $Q = A\,t\,u\,h$, where Q is the amount of heat required, Btu per hr; A is the area, sq ft; t is the melting rate, ft per hr; u is the snow density, which is 6 lb per cu ft at 25 F; and h is the latent heat of fusion of snow (and ice), 144 Btu per lb. Therefore, computing for 1/12 of a foot of snow per hour, the Q required is 72 Btu per hr per sq ft of sidewalk area. Using an efficiency of 70 percent for the system, the total required input is approximately 100 Btu per hr per sq ft of sidewalk area.

Many installations use circulating water between 150 and 160 F, with a temperature drop of 20 F for the system. The amount of water required is easily calculated by multiplying the sidewalk area in square feet by 100, the result being the Btu requirement. The water requirement in gpm is found by dividing the Btu requirement by 60 × weight per gallon at the average temperature of the solution in the coils × specific gravity × specific heat × temperature drop.

It is common practice to mix an antifreeze solution with an ethylene glycol base with the circulating water to prevent freezing. At zero deg — a good basic design temperature in the New York area — the flowing mixture should consist of one-third of antifreeze by volume.—A. J. BREUGELMANS.

GEORGE D. LAIN —

"I Believe Operating Costs Are Conservative"

THE INSTALLATION costs given by Mr. Breugelmans are in the same range as those that have been given to me, while the average operating cost is somewhat higher. This can vary depending on whether a cost for interest on the investment is included.

The formula used for determining the heat output is one that is often applied, but is considered rather conservative in view of the fact that in addition to the heat required to change the snow from a solid to moisture, other heat requirements must also be met. These include raising the temperature of the snow at falling to the melting point, heat for evaporation of some of the water formed by melting, convection and radiation losses in addition to the reverse losses from the slab.—GEORGE D. LAIN, Research Engineer, Committee on Steel Pipe Research, American Iron and Steel Institute.

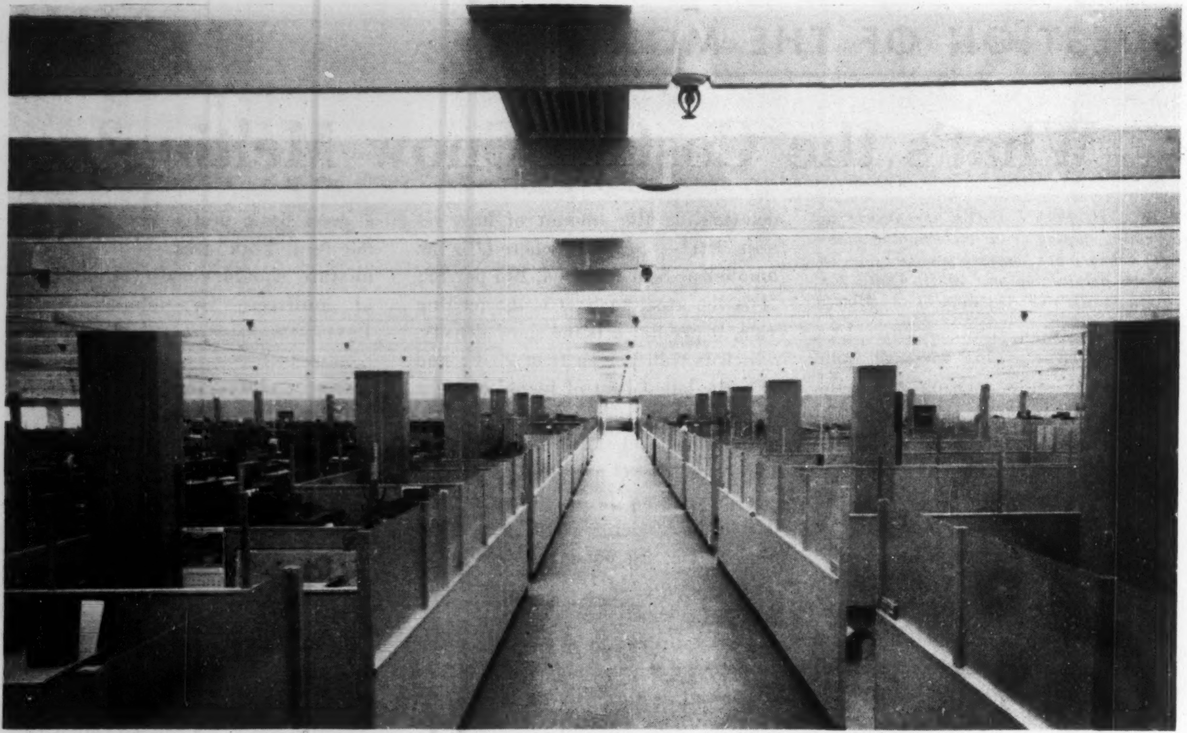
READER ASKS —

"Can Overhead Pipes Be Used to Heat Plant?"

"We are planning to install steam pipes overhead in a new plant, and we would like to know the heating results that may be expected if metal reflectors are installed over the pipes, facing downward. We believe that the radiation from these pipes would probably be appreciable in heating the plant, but we have no evidence or information on the results that may be expected.

"I would be interested in learning from other HPAC readers what experiences they have had with this method of utilizing waste heat."—J.A.R.

[*You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*]



ENGINEERING-DRAFTING area of Douglas Aircraft's building. Rectangular air outlets (300 of them) provide cool or warm air, handle return air

Ceiling Serves 7 Uses

IN THE NEW engineering building of the 22 year old El Segundo division of the Douglas Aircraft Co., Inc., El Segundo, Cal., seven basic services are integrated into the unique ceiling construction. It provides the following:

1) Air distribution and return.
2) Sprinkler system.
3) Acoustical equipment for noise control.
4) Fully diffused lighting of 90 to 100 ft-candles.
5) Power distribution for electrical office equipment.
6) Telephone services.
7) Public address system.

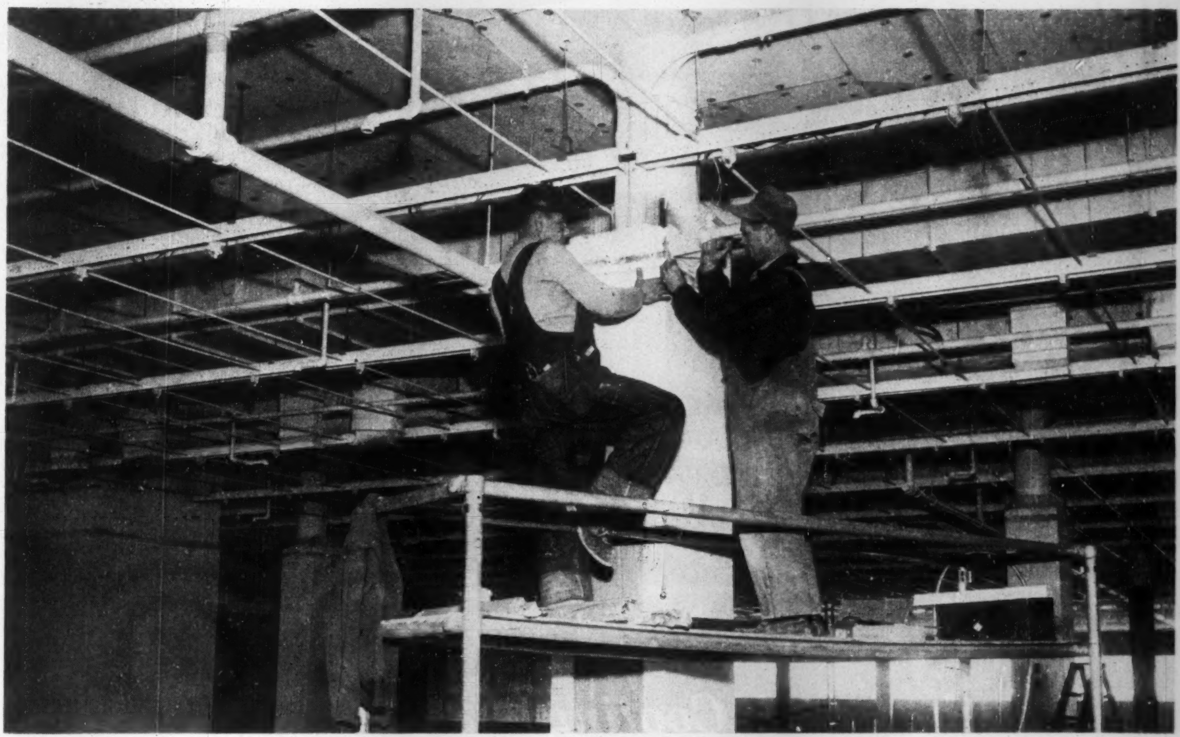
These multiple services are provided in the 210 × 210 ft engineering-drafting area and in 13 private offices. Principal use of the $2 million, two story, steel and concrete building is for the design of supersonic jet planes for the Navy.

Air Distribution

The air distribution system consists of rectangular outlets 14 × 36 in. on 12 × 30 ft centers in groups of two outlets end to end at each location. This provides about 300 air distribution outlets to each floor. They furnish cool air or warm air and handle the return air. The air conditioning system is of 450 ton capacity, providing changes of air 12 times hourly. Air returns are important particularly because of the large number of electrical machines in the engineering department. It is estimated that one "mechanical brain" computer generates enough heat for a five room house in an eastern winter.

Lighting Control Details

Windows are glazed with tinted glass, and vertically louvered aluminum shields outside the south win-



PIPES, DUCTS AND wires form maze above heads of workmen

. . . among them air distribution and return

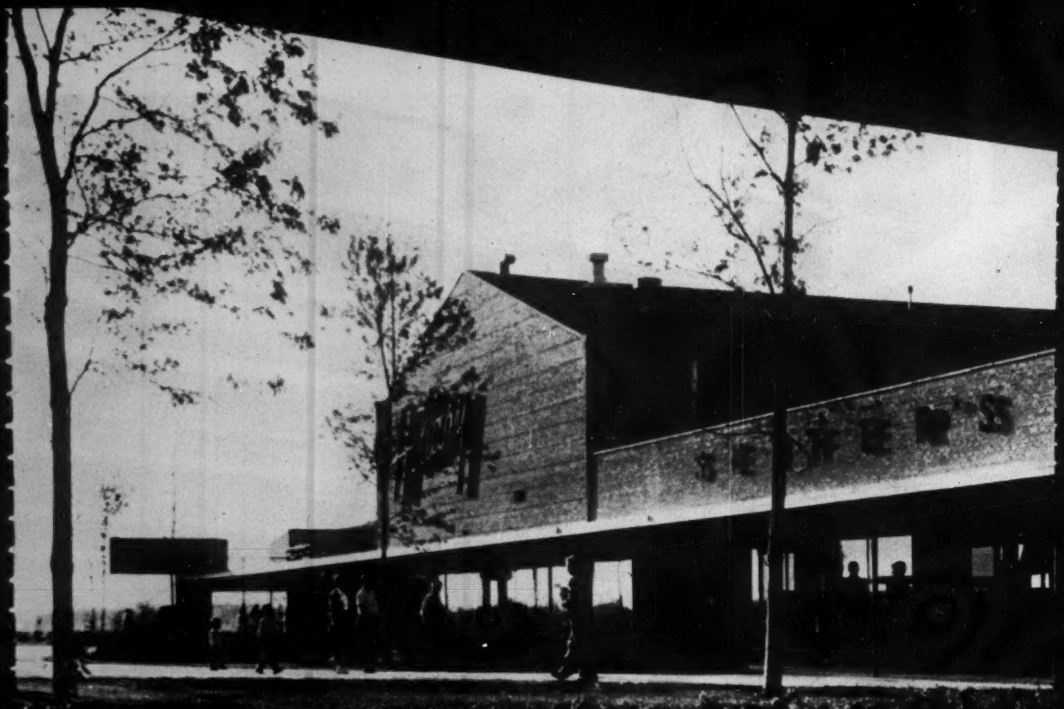
dows are solar controlled to eliminate direct glare automatically throughout the day. In each of the large drafting room areas 1800 eight ft standard white (3500 deg Kelvin) lamps mounted on 36 in. centers maintain between 90 and 100 ft-candles of light intensity. The maximum brightness of the diffusers suspended below the lamps is 150 ft lamberts. Acoustical baffles suspended below the corrugated plastic diffusers also furnish shielding for the light.

In the entire installation there are 3,844 eight ft lamps, 89 six ft lamps, and 46 four ft lamps.

Sound control consists of perforated, wedge shaped acoustical baffles on three ft centers with cross baffling every 30 ft. The total footage of baffles is just under 30,000 ft, more than five miles. They give a sound control so that personnel working 20 ft apart are hardly conscious of any other voices in the room.

Installing this seven way ceiling unit required a job of mass cooperation between all building trades without precedent, because it required mass integration of parts for which there was no experience background.

Chief Engineer Edward H. Heinemann says that one of the toughest hurdles to any large enterprise is turn-over of personnel in which the company has invested heavily in training and eventually valuable experience. He says that climate has been a big offender in engineering turnover when drafts or the opposite, stuffiness, make engineers dissatisfied; and the same applies to poor lighting, "bad for personnel healthwise and for work accuracy. Therefore, the company planned and succeeded in furnishing fundamentals for good health and efficiency, controlled climate, high levels of lighting diffused for comfort and minimal shadows, noise control, and plenty of space."



Heating And Cooling

The Modern Shopping Center

By R. J. Abramson
Consulting Engineer
R. J. Abramson & Assoc.

IN PLANNING the heating and air conditioning for the modern shopping center, the engineer and owner must decide on the system to be used. Almost everyone now desires air conditioning, but how shall the heating be accomplished? Will it be heated by warm air furnaces or a boiler plant? Is supplementary entrance heating required? In answering these and a host of similar questions, it is helpful to consider all of the factors.

In the shopping center, a suggested limit of engineering design should be the utility distribution systems and the integration of individual shops into the project as a functioning whole. This is generally modified to include project-furnished heating and ventilating systems adapted for tenant addition of air conditioned equipment and maintenance of all of the mechanical equipment.

Estimating Unit Cooling Loads

Before getting into the discussion of heating shopping centers, I would like to cover the subject of estimating the air conditioning load. A set of realistic estimating units has been developed from a study of installed air conditioning units within an area of 150 miles from Chicago and are given in the accompanying table.

These units represent total heat gain in Btu per hr per sq ft for typical non-combustible buildings with insulated roofs. The total heat gain—building area in sq ft × unit—provides for infiltration, people, ventilation and lighting loads. The maxi-

ESTIMATING UNITS for Air Conditioning Shopping Centers in the Chicago area.

Occupancy	Heat Gain, Btu per hr per sq ft	Heat Loss, Btu per hr per sq ft
Women's or Men's Apparel	40	40
Drugs (no lunch)	40	40
Drugs (lunch)	50	50
5 & 10 (no lunch)	50	50
5 & 10 (lunch)	60	60
Restaurants - Delicatessens	55	55
Department Store	45	45
Jewelry, Shoe Repairs and Service Stores	35	35
Doctor's Office	40	40
Business Office	35	35
Branch Bank	35	35
Currency Exchange	35	35
Super Food Stores	50	50

mum glass area is 25 percent of the store perimeter area.

These estimating units can be adapted to provide the estimated air conditioning loads for shopping centers in other localities by the following empirical formula:

$$[(S_y/S_c)\ (T_y/T_c)]\ E_c = E_y$$

where

S_y = Percent of average sunshine at location Y.

T_y = Annual mean temperature at location Y.

S_c = Percent of average sunshine at Chicago.

T_c = Annual mean temperature at Chicago.

E_y = Heat gain or heat loss (Btu per hr per sq ft) at location Y.

E_c = Heat gain or heat loss (Btu per hr per sq ft at Chicago.

How Centers Are Heated

One method used in heating shopping centers is the forced warm air system. The air flow rate selected for the system is based on the air conditioning requirements, which permits a lower supply outlet air temperature. In the winter, the additional amount of lower temperature air is desirable. Also, it provides a means for supplying air over entrance doors to prevent drafts without increasing the demand on the system.

The system used in one center is a suspended, oil-fired forced warm air unit, complete with oil booster pump and room thermostat. Outside air, return air, and supply air provisions are standardized for each 20 ft bay, with ducts sized for the estimated air conditioning requirement.

Added Sales Feature

Provisions are incorporated in the supply and return ducts so that a package air conditioner with dampers may be installed without affecting the heating cycle. By standardizing, the air conditioning unit becomes the personal property of the tenant, free to be removed upon termination of the lease. This flexibility for removal of personal property equipment is deemed an added sales feature for leasing small retail sales spaces to local merchants.

Each tenant is usually required to provide water saving devices approved by the architect and engineer. This requirement permits the standardization of bay design, since all openings for waste, water, and electricity are known in advance of leasing.

Heating Larger Sales Areas

Large sales areas leased at the beginning of one project are heated by a warm air system. The system used is with a bypass around the furnace, a direct expansion cooling coil, and face and bypass dampers, operated by room thermostats for zone temperature control.

It should be noted that the size of such a system is practical for delivering from 500 to 75,000 cfm and can handle almost all types of sales spaces that are contiguous within fire walls. These systems permit the employment of all air conditioning functions, such as heating, humidifying, cooling, dehumidifying, and filtering. In addition, in case of failure, the heat source is readily replaceable.

Reheat Air in Winter

For the most effective winter cycle, this system requires a temperature raising device over the entrance doors. Where gas fuel is available, this problem is easily overcome with gas fired duct heaters installed in the ceilings or over the show windows. Under some conditions, oil fired duct heaters can be employed. By removing the fan system of a standard oil fired suspended heater, an oil fired duct air reheater can be devised. But the problem of secondary oil pumps adds equipment and the possibility of oil line leakage. Where electric rates are sufficiently low, air reheating can be accomplished by electrical strip heaters or electrical unit heaters.

This type of air system provides an economical method of preventing show window fog. Installation of simple unidirectional ceiling outlets as close to the interior window glass line as possible, with velocities sufficient to carry the air stream down to the bulkhead, entirely eliminates the problem of fogging and frosting. Further, where the architect designs a look-through store front, these same window blast outlets can serve as the air conditioning source. These grilles, installed at the front glass line, do not cause draft sensation, yet carry the proper temperature uniformly through the entire front area.

Heating, Cooling with Water

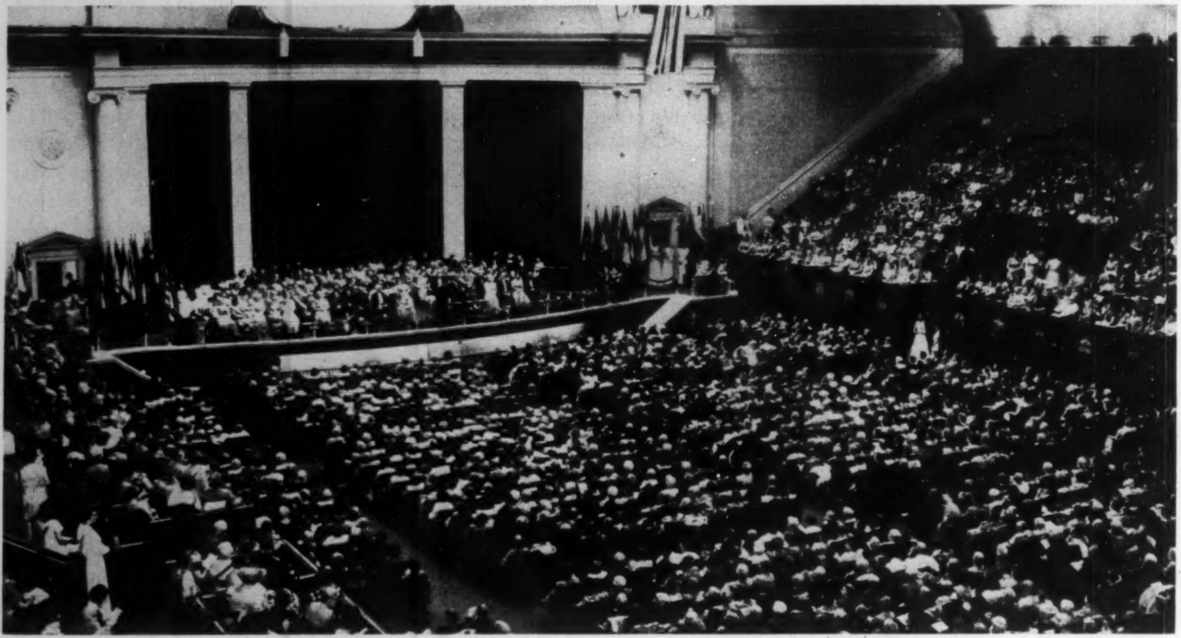
The various stores in shopping centers may also be heated and cooled with hot and chilled water. With this type of system, a group of small sales areas, each occupied by individual tenants, can be served at a lower unit cost by a single central plant. The installation consists basically of a water chilling device, with a compressor and condenser and water saving device, piping, and the several meters to measure the amount of water drawn by each individual tenant's units. Such a system could show as much as a 10 percent net return after all costs of maintenance are paid.

A hot water heating system may be installed on the chilled water piping serving the several stores. This requires a hot water boiler and a chiller plant, with the individual tenants having air handling units. Each air handling unit has a coil designed for heating and cooling and the single piping system carries hot water in the winter and chilled water in the summer. This type of system requires a basement area.

Since many shopping centers are based on the idea that the owner does not want to be in the utility business and does not wish to employ maintenance people, meter readers, billers and collectors, he will forego any profits that could be made by selling heating or cooling to the tenants. This basic choice must be made by the owner upon presentation of the engineering data.

Where well water is available at sufficiently cold temperatures, then the use of central or sub-central well systems is definitely indicated.

Other articles on the shopping center have appeared in HPAC for April, June and July 1954.



THE NUMBER of small ions in an unoccupied room is substantially the same as outdoors, according to one study. But when a room is occupied, the number of small ions decreases rapidly

How Ion Density Affects Comfort

By Howard C. Murphy
Consulting Engineer

• There is increasing evidence that the electrical characteristics of the air have a subtle but definite effect on human comfort in mechanically ventilated and air conditioned spaces. These areas are usually measurably deficient in small negative ions or have an excess of positive ions. The author suggests that methods be adopted to maintain the balance of ions in enclosed areas on a par with normal outdoor values.

THE SECRET of reproducing the freshness and other stimulating qualities of the ideal outdoor climate in mechanically conditioned indoor air has not yet been fully discovered, even though extensive study has been devoted to the subject.

Difficult to Describe

Many attempts have been made in this country and abroad to identify the missing elements or factors. We can and do produce indoor environments having ideal conditions with reference to temperature, humidity, air movement and air purity. However, there appears to be at least one other factor — a "missing link" — something we cannot even describe, differentiating man and nature's product.[1] (All references are listed at the end of the article.) Occupants of air conditioned rooms still complain of "stuffiness" and various other symptoms which they feel — or think they feel — but find hard to describe.

Mr. Murphy, a member of HPAC's board of consulting and contributing editors, has had a wide experience in the fields of air sanitation and air purification. He has published numerous articles on these subjects.

Because negative ions have a higher mobility, they are depleted faster than positive ions. Only by the generation of negative ions by ionization can the ion density be maintained at the comfort level in an air conditioned room.

As early as 1923, the New York State commission on ventilation, after extensive studies, reported that they found a greater feeling of well being in rooms using open window ventilation than in mechanically ventilated spaces.[2] This did not seem logical from an engineering standpoint and attempts were made, and for that matter are still being made, to attribute the reported discomfort to claustrophobia or some similar psychosomatic reaction.

It would appear that every possible factor has been canvassed in an attempt to identify the subtle but definite difference between man and nature's best efforts at manufacturing climate. For instance, the chemical elements of the air have been examined carefully without the discovery of any evidence that they are causative factors.

Is It Ozone?

There was a considerable school of thought 20 years ago which believed that variations in the amount of ozone in the air accounted for the difference between comfort and discomfort in indoor air. Careful research reported by several investigators did not substantiate this theory.

One group of investigators in Switzerland has reported evidence that an oxidizing agent similar to ozone, either O_4 or O_5, was the missing factor.[3] These gases do not have the characteristic odor of ozone, and the spectrum is different. Work is continuing in Switzerland on this theory, but it has not received general acceptance.

For ages mankind has believed that the winds had an effect on mental and physical well being. The "Sirocco" in the Mediterranean countries; the "Fohn" in the Alps; the "Solano" in Spain; the "Chinook" in Alaska and the "Zonda" in the Argentine, all have been credited with specific effects on mankind, as well as on many other living creatures. It appears significant that many of the effects attributed to these causes appear in advance of the winds themselves and are frequently forecast by persons with certain disorders, especially older people with rheumatic conditions, as well as by some animals, insects and plants.

THE ION concentration of room air may be increased by a generator, shown here schematically. Ionization from polonium foil provides an even and continuous flow of ions to the atmosphere

Or Barometric Pressure?

It has been frequently remarked that persons with arthritis or rheumatism correlated the onset of discomfort with a falling barometer. It has also been noted that these reactions are more severe in some localities than in others. It has also been observed that these discomforts are more pronounced in areas with loose sandy soil, such as is found at the seashore or with loose soil, having considerable depth down to the water table. When the soil is saturated with water and is frozen or is covered with snow, the symptoms are less evident. In such locations, the air is respired in and out of the ground more extensively in conformance with changes in the atmospheric pressure, than in places where the top soil is underlaid with rock.

An excess of negative ions has been observed at certain famous "spas." Does this account for their reputations as health resorts?

With a falling barometer, the air issuing from the ground carries a relatively high density of ions formed by radioactive elements in the soil. It has been postulated that certain susceptible persons, as well as many birds and insects forecast the weather by their awareness of changes in the ionic characteristics of the air.

Many European "spas" famous for their curative baths and health giving waters are located near bubbling springs or waterfalls. The chemical properties of these waters are easily determined. Bottled and away from the springs, many of them appear to have little potency.

Perhaps Air Ionization?

It is possible that the success of some of these resorts may be due, at least in part, to air ionization. Recent measurements of the air ion concentration at some of these health resorts show an unusual preponderance of negative ions, apparently due to the well known Lenard effect. The Lenard, or the "waterfall effect," occurs when a surface of water is suddenly disrupted, as in a spring, fountain or waterfall. Numerous small droplets are formed. In pure water, these droplets usually carry a negative charge to the surrounding air, whereas larger drops, with a positive charge, fall to earth at once. If the water is contaminated with certain impurities, the charges may be reversed. Ionization is also affected by radioactive materials issuing from springs and the soil in some areas.

An interesting instance of the Lenard phenomenon is seen in the great waterfalls at Bad Gastein in Austria, a resort which has been famous since the seventh century. The falls drop 500 ft and the fine mist carries a considerable distance. Investigation has shown a predominance of negative ions in this mist.

Negative Ions the Answer?

A number of investigators in this country and abroad[4] have reported physiological and biological reactions with the use of unipolarized airborne electric charges. The studies, as a rule, seem to indicate that, with certain sensitive individuals, negative ions produce a feeling of physical and mental well being, mental alertness and optimism. On the other hand, treatments with positive ions are frequently reported to be the apparent cause of headaches, fatigue, dizziness, ill temper and fear. Changes in blood pressure, rate of breathing, oxygen consumption and pulse rate are also reported.[5]

Professor Friedrich Dessauer, for the last 40 years one of the European pioneers in this field of medical physics, has published a number of reports covering his investigations and studies over a period of years.[6] He still continues his work with negative ions at the University of Fribourg in Switzerland. Medical reports indicate that in the years from 1942 to 1950, over 25,000 treatments were given with the Dessauer and Janitsky ionizing apparatus with encouraging results. The treatment is reported to be most effective in some of the circulatory disorders.

Yaglou and his associates at the Harvard School of Public Health found that the number of small ions in an unoccupied room was substantially the same as outdoors.[7] When the room was occupied, however, the number of small ions decreased rapidly. The initial ion concentration in his tests was approximately 250 ion pairs per cc. In one hour and 25 minutes, the count was reduced to 50 per cc. Yaglou calculated that it would require 160 cfm of outside air per occupant to maintain a small ion concentration equal to the outdoors.

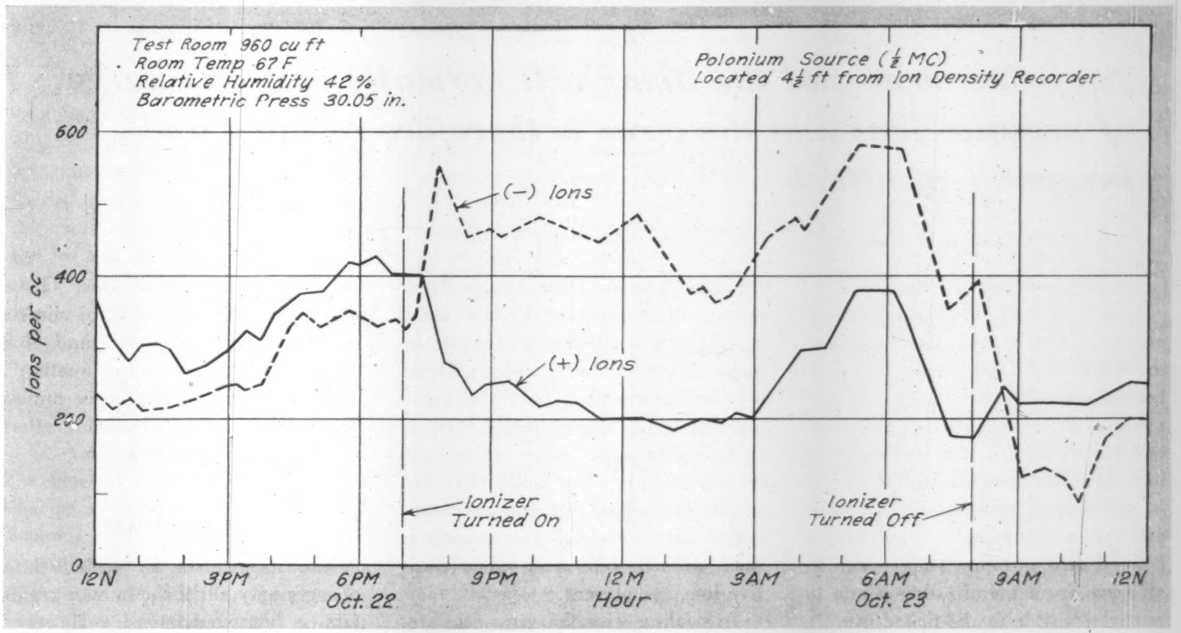
In subsequent investigations, using small ions, Yaglou reported that negative ionization seemed to produce a cooling effect, but the most frequent sensation was relaxation and sleepiness. The effect was noticed a few minutes after turning on the ionizer.[8] He reported that these reactions occurred mainly in subjects having a comparatively high blood pressure, a high pulse rate or a high metabolism. He found that, as a rule, relaxation was concomitant with a fall in blood pressure, the pulse rate and metabolism.

He also reported that some subjects found an appreciable freshness in ionized air, particularly in the case of negative ionization, but the preference was not strong enough to suggest a striking improvement in the air except perhaps in the case of persons who had disturbances of the circulatory systems or some other disorder.

Breathing Aided

Koller and others report that positive ions greatly increase the rate of respiration, while in the case of negative ions, patients breathe more quietly and there are frequent pauses in respiration. Koller further points out that with ions having mobilities between 0.0007 and 0.009 cm per sec per volt per cm, 15 percent to 40 percent of inhaled ions were retained in the lungs. When heavier ions were used, the absorption in the lungs was much less. In the case of lighter ions, the absorption in the passages of the nose and throat was so great that only a relatively small proportion of the ions actually reached the lungs.

Rinfret has reported evidence of



RESULTS OBTAINED by using a simple ion generator are charted above. When the ionizer was turned on, negative ion concentration increased from 200 per cc to almost 600 cc, exceeding positive ions by over 200 per cc. With the ionizer turned off, positive ions outnumbered negative ions by 100 per cc

the effect of ions from radioactive sources on the functions of the adrenal glands.[9] Worden reports that laboratory animals under unipolar ionized air showed changes in pH of the blood.[10]

At the annual meeting of the American Association for Cancer Research in Cleveland in 1951, Dr. B. Skokoloff and associates reported that their studies indicated that negative ionization had no destructive effect on cancer cells, but appeared to increase the resistance of the body to malignant growths.[11]

Chase and Willey have reported that clusters of Drosphils melanogaster, subjected to ionized air, deteriorated and died, indicating that ionization has lethal effects on such living organisms.[12] It should be noted that the work of other careful observers has failed to confirm these findings. There seems, however, to be a somewhat general agreement that there are indeed some subtle physiological effects due to air ionization.

Explain Variation in Results

With our present knowledge of the various factors involved in this field of research, it seems possible that this lack of agreement in the findings of different groups of investigators might, to some extent, be due to the wide variations in the method of developing test ions, as well as the ion concentrations used in the studies and the variation in the different types of ion counters used. For instance, Professor Friedrich Dessauer, in his work uses submicroscopic MgO dust ions. Other investigators have used various types of heated wires, high voltage brush discharges, ultraviolet photo ionization, radioactive ionization and X rays. Some of these methods, however, also produce ozone, the oxides of nitrogen or other byproduct impurities.

It has been customary, even in carefully prepared reports to refer to "ionized air" as if it were a well established and definitely evaluated factor. As a matter of fact, it is a difficult matter to determine accurately the ionic content of the air, and until very recently, results obtained by available methods could not be interpreted with an accuracy of more than ± 20 percent. Ion counters do not count ions. They count the number of unit charges of positive or negative electricity collected by the counter over a certain period of time. This figure, correlated with the volume of air handled by the counters, makes it possible to determine the number of unit charges contained in the air sample.[13]

Each Unit Charge One Ion

If it is then assumed that each ion or electrified particle carries only one unit charge, we can assume the number of charges to be the number of ions. If this were an entirely valid assumption and we could safely say that an ion was merely an atom or molecule, or group of molecules with one electron removed or added, if there were no changes due to humidity, air impurities or the age of the ion, this would indeed be an acceptable assumption.

However, like most of Nature's handiwork, the matter is not that simple. The small ion probably consists of a single molecule when first formed. This simple structure lasts only a fraction of a second. According to Loeb, it then agglomerates with other molecules or becomes attached to a particle of dust forming

". . . The virus and the living cell normally carry a charge of negative ions and the virus is therefore repelled and incapable of attack. . ."

larger and less mobile ions.[14]

Ions are usually divided into three groups. Small ions have average mobilities of 1.5 cm per sec in a unit field of pure dry air. Large or Langvin ions have mobilities of less than one thousandth of this, and medium ions have intermediate mobilities. It is, of course, understood that ions are not usually found in any sharply defined size group. They occur in all sizes from atomic dimensions to particles visible to the naked eye.

Weather Affects Ion Content

Under normal conditions, cosmic and other forms of radiation are the principal sources of ions in the lower atmosphere. The ionic content of the air shows regular annual and daily variation.[15] Considerable variations occur in response to weather conditions. When visibility is good, and when the direction of the wind is from the sea or high mountains — for instance, the Fohn wind in the Alps — the ion count is exceptionally large. The number of small ions decreases with a fog or mist; they increase with humidity, or with a land wind from an industrial area. Snow storms, forest fires, etc. cause large variations in the ion count. An increase in humidity also decreases the mobility of negative ions, while positive ions are unaffected. Usual concentrations may vary from 400 ion pairs per cc to over 1800 ion pairs per cc. As a general rule, the number of positive ions exceeds the number of small negative ions in the lower atmosphere.

Negative Ions Repel Viruses

Dr. Theodore Puck of the University of Colorado Medical Center reported at the 1950 meeting of the American Chemical Society that there were indications that viruses must carry certain electrical charges in order to attack living cells. There are indications that both the virus and the living cell normally carry a charge of negative ions and the virus is therefore repelled and incapable of attack. It has, in fact, been established that bacterial viruses attach themselves to cells only when positive ions are present.

In dealing with the virus, we are, of course, considering fantastically small organisms or entities. The poliomyelitis virus, for instance, is only approximately 8 to 10 millimicrons in size. The influenza virus would be approximately 10 times as large, perhaps about 115 millimicrons in size.

Puck and Sagik described recently in "The Journal of Experimental Medicine" — June, 1953 — an ingenious experiment which gives support to the theory that the invasion of a cell or a bacterium by the virus is an electrical phenomenon. In their experiments, they used ion exchange resins instead of living organisms for the targets of the viruses. They found that viruses readily attached themselves to the positive resins, but would not adhere to negative resins unless positive ions were added. They found that cells like viruses carry a negative charge and stick to positive, but not negative exchanges.

These discoveries may offer a possible explanation as to why some individuals or groups of individuals appear to have superior powers of resistance to certain diseases.

It has been noted that under normal conditions the ionic content of the lower atmosphere is usually slightly positive. During storms, negative ions from the upper air sometimes invade the lower atmosphere creating an excess of negative ions. In a lifetime study of the effect of climate on health, Huntington found that "storms", "changes in the weather", or disturbances of the lower atmosphere do have an observable effect on health and well-being.[16]

Human Body Electrical

The mechanism by which these charges may affect the human organism is not understood. However, for over a century investigators have noted the similarity of the human body in many ways to an electrical system. We have "generators," "transmission lines" and "storage batteries." We measure the electrical charges developed by the heart with the electrocardiograph. The electrical potential normally present in the brain and in other organs can also be measured by other appropriate instruments.

In the body we have an acid colloid and an alkaline colloid separated by a semi-permeable membrane, setting up extremely minute, but measurable electric potentials between the positive and negative poles. The body contains hundreds of different membranes which are important in the proper functioning of various organs. Biologists have for many years studied the role of these ion-selective membranes in the operation of the lungs, kidneys, nerves, blood vessels and intestinal tract.

It has been observed that when the alkalinity of the blood disappears and a neutral point is reached, there is no flow of electrical potential, the cell ceases to function and the patient dies. Recent studies by the Atomic Energy Commission at Brookhaven National Laboratory emphasize anew the fundamental necessity of maintaining the delicate electrical equilibrium within the molecules and cells of the human organism. Dr. A. L. Lehninger, Professor of Physiological Chemistry of Johns Hopkins Medical School, and Dr. F. O. Schmitt, Biologist of Massachusetts Institute of Technology, reported at the meeting of the National Academy of Sciences in 1952 that they had studied and measured the extremely small cells or "storage batteries" which carry electric charges in the body.

Human System Can Be Affected

Dr. George Crile[17] postulated that the mechanism by which electrical charges are generated within the cell depends upon ionization of atmospheric oxygen. He felt that when oxygen is not ionized, there is an impairment of the normal mechanism within protoplasm. It was his conception that oxidation within the cell sets up short wave radiation which knocks off electrons. These electrons charge the intricate network of the nervous system.

Crile's observations led him to believe that atmospheric oxygen, when it reaches the alveoli of the lungs, is usually at a low energy level. It was his opinion that it does not become chemically active and capable of energizing the organism by oxidation until ionized by radiation emitted by the radiogen in the body.

However, whether air ions, entering the body through the respiratory system, can in themselves or acting as catalysts, significantly alter the electrical equilibrium of the human organism, has not been established.

Investigations with laboratory animals, it is true, have shown definite changes in glandular functions due to air ions and there is considerable clinical evidence that air ionization can affect the human pituitary adrenal system.

Human beings may be, and frequently are, affected by so many and such varied stimuli, mental, chemical and physical, that it is sometimes difficult to say definitely whether the results reported by various investigators are due to ions or to a combination of other causes. Even when, as in most of the investigations, the subjects did not know whether they were receiving positive or negative ions or untreated air, they knew they were undergoing tests and their reactions may, therefore, have been influenced.

Many investigators have, therefore, preferred to confine their tests to laboratory animals, bacteria and plant life where test conditions can be more positively controlled. It is expected that these tests will provide the basis upon which successful clinical observations can be conducted.

[Schematic drawing courtesy Wesix Foundation.]

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Marshall Field's to Complete Air Conditioning

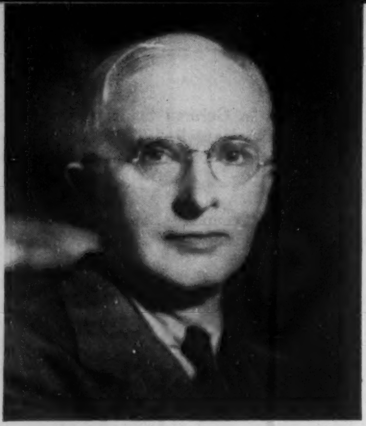
. . . increasing capacity to 5030 tons

AIR CONDITIONING of all customer areas of the Marshall Field & Co. downtown Chicago store will be complete when the current $1¼ million project is finished next June 1. This will bring the company's total investment in air conditioning for the downtown store to more than $6 million during the last 10 years.

The total installed capacity when this phase is complete will be 5030 tons. The present work in the main store will complete the air conditioning of the third, seventh, eighth and ninth floors. In the Store for Men across the street, the project will include the fourth and fifth floors. Other public areas in this store already are air conditioned.

The company's two suburban stores are completely air conditioned.

The Kroeschell Engineering Co. has the contract for the entire air conditioning system.



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

SAM LEWIS' PAGE

If hot water heating systems are half full of air, they can't perform satisfactorily. The reason . . .

Water-Logged Expansion Tanks

LARGE, mechanically circulated, hot water heating systems are always interesting. A pumped liquid that can be controlled at a temperature warmer than that of the air we wish to heat is an exceedingly useful vehicle.

There is an increasing tendency also toward application of chilled water for removing undesired heat from air, and for circulation of chilled water in warm weather through the imbedded pipe coils of radiant heating systems. This scheme to make the investment in heat transfer appliances earn its keep, is commendable and is safe if instruments to keep the cool surface safely warmer than dew point are on the job.

In dealing with many large, forced circulation heating plants, I find that the boilers, pipes, pumps, valves and heat transmitters are reliable and are practically trouble-free. However, I have found that the expansion tank sometimes causes trouble, and I would like to cite some of my experiences. In my own home, this tank is in the attic and has a vent to the atmosphere and a tell-tale overflow pipe to the boiler room. I have no trouble at all with water-logging in this tank.

In a certain eight story factory, the expansion tank is in the basement. An electric air compressor maintains a cushion of air above the water in the tank to force the water out from the bottom of the tank and up to the eighth story. The air pressure is maintained at 65 psi, sufficient to keep the highest radiation full of water.

Find Expansion Tank Hidden

On the other hand, a five story commercial building which I visited recently was in difficulties with its four year old hot water heating system. One complaint was that the occupants of the fifth story would usually be cold, while at the same minute the occupants of the stories below would be opening windows to keep from being too warm.

In this case, the expansion tank was modest and retiring, not being evident in either the boiler room or in the attic. I finally found a thick, strong tank, evidently intended for expansion, but entirely filled with water. It was on the first story, entirely encased within a wood barrier above a toilet room. The tank was innocent of any water level or pressure gage, or any other means of determining how much water and how much air cushion was inside. One could not even inspect the tank without borrowing a ladder and overalls and going through athletic maneuvers. On opening the alleged drain valve, nothing happened. The outlet was stopped completely.

I proceeded to the boiler room in the basement and found a 2 in. diameter pressure gage hidden above the top of the boiler. The pressure was 30 psi, barely enough to force water to the fifth floor radiators.

Primitive Operating Methods

Evidently the fireman, who didn't even know about the concealed expansion tank, had for years merely opened the city water supply valve until (he thought) the system must be full. Then he climbed to the fifth story and with a big screw driver managed to open a few screw-head type air valves on the radiators. Some air would very gently emerge for a time. Occasionally, he would go back to the boiler room and open the city water supply valve again, although he learned that the penalty for too much of this would be a discharge of scalding hot water through a relief valve, which providentially remained on the boiler header.

I borrowed a screw driver, since neither my versatile key-chain tag nor a dime between my thumb and fingers could open a fifth story air valve. A tiny breath of air emerged but no water, explaining elegantly why the occupants tended to be cold. A hot water heating system half full of air has never been found to be an acceptable heating system.

Water-logged expansion tanks and recalcitrant manual air valves are an abomination in this technological age. They create the dangerous necessity of shutting off the connection between the boiler and the expansion tank, while one patiently drains the expansion tank. This is usually a regurgitating process because air must enter to let the water out. In this case, my shoes and clothes proved to be a convenient receptacle for the liberated water.

Recommend Electric Air Pump

A cushion of air was eventually achieved in the tank and the connection with the heating system was reestablished. After reventing all the radiators, we hopefully took our departure.

The tank, however, did not hold its air cushion indefinitely, despite clever little air catchers that are supposed to maintain it. Thus, water-logged expansion tanks are too frequently encountered. Since electric water pumps are common today and since every automobile service station has an air pump, there are no excuses for failure to insure the desired air cushions in closed expansion tanks by providing air compressors. Of course, to assure the cushion, the fireman must be taught to close the switch on the motor that drives the compressor. I recommend judicious use of air, the excellent servant.

Air introduced at considerable pressure so as to form bubbles has proved of great value in keeping fish alive under thick ice. It promotes open water in winter for migratory ducks and their cousins. It prevents damage to powerplant turbines from cakes of ice. And a cushion of air maintained in an expansion tank will insure efficient, satisfactory operation of a hot water heating system.

Boost Water Rates for Air Conditioning?

. . . Recommendations in the Kansas City council reflect growing trend of city groups to impose restrictions on nonconserved water for air conditioning

INSTALLATION OF new nonconserving water air conditioning systems in Kansas City, Mo., is prohibited by an ordinance adopted recently by the city council.

The ordinance was introduced after the city manager filed an engineering report warning the city that the "tremendous increase" in nonconserving water air conditioning would place a burden on all water users unless restrictions were made or water rates for such systems were increased.

Expansion Estimated

Even with an increase in rates on nonconserving systems, according to the report, the city would have to prepare to expand the capacity of the water works to 308 million gal per day by 1970. That would be an increase of 98 million gal over the 210 million gal capacity provided in an expansion program expected to be completed by 1956. The present capacity is 155 million gal per day.

Although estimating that such an increase in water capacity would cost $50 to $60 million, the city manager believes that an increase in rates consistent with the cost of supplying water for air conditioning would be sufficient to pay the cost.

The report estimates that the water demand would reach 459 million gal a day by 1970 if the use of water for nonconserving systems is not restricted. This would cost "at least $90 million" for plant expansion.

Refrigeration type window air conditioners, which do not use water, are not included in the adopted prohibition. Systems which recirculate the water are not included, either.

Ask $17 a Ton Demand Rate

The city manager and water department director recommend a demand commercial rate of $17 a ton for nonconserving air conditioning systems for each season, in place of the present 16 cents on each 100 cu ft of water used.

The demand rate would be collected as a type of minimum charge, regardless of the amount of water used and would be in addition to the water charges.

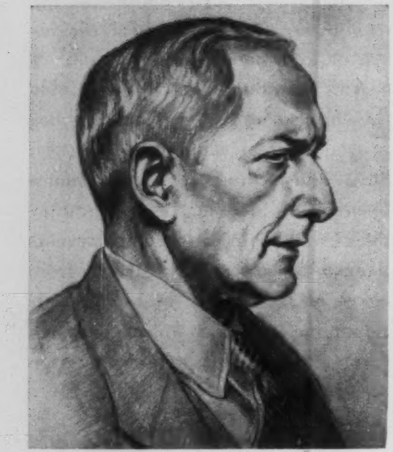
The $17 a ton, say the two officials, would be comparable to a rate of 28 cents a 100 cu ft, recommended by three engineers in 1952 but turned down by the council in favor of the 16 cent rate.

Also recommended is a demand residential rate of $6 a ton on air conditioning, added to the present rate of 22 cents for each 100 cu ft. This would make the overall rate 28 cents.

Further, a way is being sought to amend contracts for furnishing water outside the city, putting into them restrictions on installation of nonconserving air conditioning units.

THE LAW AND YOUR PROFITS

Who Owns Air Conditioning Installation?



WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background. This month he discusses the right of title to an air conditioning system installed in an existing building at the expense of the tenant.

DOES AN INSTALLED air conditioning system become a part of the realty, and does title to such system pass to the purchaser or lessee when the building is sold or rerented?

If title to heating and air conditioning equipment so passes, what indirect rights and privileges go with it?

These questions pertain to the welfare of the heating and air conditioning contractor, as well as to that of tenant, owner and purchaser. Recently decided cases present intriguing angles to these questions. Let's start with an example in a large city:

Persons in our little drama are a heating and air conditioning contractor, a building owner, a first tenant, a second tenant, and a prospective tenant. The contractor, whom we'll call the Air Co., installed in the Lanlawd building a combined heating and air conditioning system, valued by Lanlawd at $30,000. The system was paid for by the old tenant, Hohum Appliances, who contracted with Air Co. for its installation.

Property Owner Gets Title

Subsequently Hohum Appliances went into bankruptcy, and Soso Television bought its assets for $290,000 — including, according to Soso's thinking, the heating and air conditioning system appurtenant to the Hohum lease. When the lease expired, Soso Television began dismantling the system preparatory to taking it out along with other acquired chattels.

When Lanlawd got wind of Soso's activities, he rushed to court and asked that the television firm be enjoined from removing the heating and air conditioning. He claimed that the whole system was an integral part of the real estate and was therefore his own absolute property. His point was that when the system was installed, it was "intended and agreed," both by him and Hohum Appliances, that the heating and air conditioning equipment would become part of the real estate. In proof of this contention, Lanlawd cited a clause in the lease providing that Hohum could make no changes in the system without the property owner's consent.

Lanlawd further averred that he had rented the premises to another tenant, who would move in as soon as Soso vacated, but if the heating and air conditioning were removed, would refuse to occupy. In consequence, Lanlawd would suffer "irreparable injury" embracing loss of rents and probably of a good tenant as well.

Armed with these representations, Lanlawd sought relief in the form of an injunction. After due but prompt consideration, the court enjoined Soso from removing the air conditioning and heating equipment.

System Becomes a Fixture

In our second and rather unusual case, the supreme court of another state laid down the general principle that "whatever is affixed to a building by an owner to *facilitate its use and occupation* . . . becomes a part of the realty." Specifically, said the learned justice, "In the case at bar, the heating equipment was necessary to the purpose to which the realty was adopted and it became a fixture upon its annexation to the property."

This dispute got into court in a roundabout manner. Business became so good for the Noman Tube Corp. that it decided to build a larger plant in another part of town. The old plant had been serviced for some years under a space heating contract with the local gas company, but plans for the new structure called for oil heat. Before the general contractor had done more than dig the foundation and pour some concrete, the plans were revised by adding 20 ft to the building's length and by eliminating the oil heat and the boiler room.

It was contemplated that the space heating contract with the gas company would be transferred from the old building to the new. Accord-

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All names in this article are fictitious.

ingly, in October the gas company testified in court that Noman Tube Corp. applied for such transfer and that the application was promptly approved by the gas company after its inspection of the new premises. However, no parties at interest, outside the public utility field, seem to have taken into consideration the fact that the gas company either could not or would not furnish gas to both the new and old building.

Meanwhile, on September 25, one Shiloh Shrude, the contractor to whom Noman had conveyed the old premises in a "capital gains and losses" deal, sold the property to Irad Foundries, who received a warranty deed thereto on October 29. Early in December, Irad surmised gas trouble and on January 26 went to court and asked that both the gas company and Noman be enjoined from discontinuing gas service at the old plant or removing any gas heating equipment therefrom.

The trial court decided that Irad Foundries had purchased the building in good faith without notice of any reservations, and that the purchase included the gas heating system together with the *right to be furnished gas for heating purposes.*

On appeal, the lower court's judgment was affirmed. The higher tribunal, in addition to the ruling above, declared that "the right to the possession of the heating units determined the right to the gas service." By extension, this principle might conceivably be held to cover other facilities and utilities contributory to temperature control, such as water and electricity, together with contract terms in each instance.

Prospects for Room Units

While on the subject of realty, the heating and air conditioning contractor should bear in mind that buildings are superb prospects for air conditioning on a leasing basis. The units are not "real estate improvements" and so do not affect the tax assessment on the building, yet they greatly enhance its rental value. On the other hand, the rent paid by the owner on the air conditioning equipment is tax deductible as cost of operation. Thus, the owner gains "going and coming."

[Note: While this discussion applies to actual cases, it should be remembered that legal rules vary in different states.]

ON THE JOB

Conditioned Cab Keeps Crane Moving

. . . over heat-treating ovens

By conditioning the crane cab which operates in heat-treating areas of the plant, Taylor Forge & Pipe Works, of Cicero, Ill., is now able to increase the heat load without worry as to the effect on the operator.

In the company's manufacture of specialized pipe, fittings and flanges, one of the unforeseen problems was the effect of heat and fumes on men working over heat-treating areas. Temperatures in these areas are constantly around 140 to 160 F, but soar much higher when the ovens are opened to remove heated forgings. The cab of the crane is then subjected to heat up to 1000—1100 F.

Although the cab had been previously enclosed, the crane operator could work just long enough to remove material from the oven and then would have to scramble down out of the crane for relief.

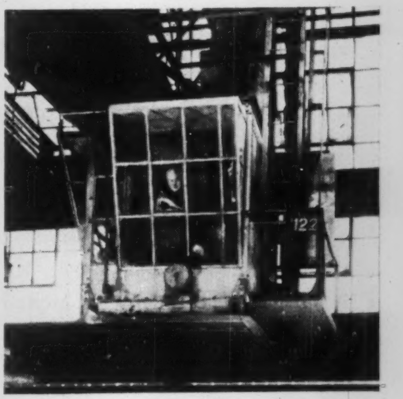
Another problem which caused annoyance was the fumes from the ovens and the oil quench bath. After the heated forgings are removed from the dome type ovens, they are dipped — red hot — into an oil bath. When this red hot metal hits the oil, fumes soon envelop the entire area over the bath in which the crane is working.

When the company decided to eliminate these problems, an air conditioning unit with a 3 ton cooling capacity was installed. Continuous ventilation as well as removal of dust, dirt, gas, fume and odor are provided. The self-contained unit uses air for condensing.

Because of space limitations, it was installed vertically, on top of the cab. A duct was run from the unit into the back wall of the cab. Return air is drawn from the floor.

Air, entering the conditioner, is first drawn through a bank of conventional and activated carbon filters, and is then cooled before being returned to the cab. Sufficient make-up air is provided by cab infiltration.

Temperature in the cab now is maintained between 75 and 80 F.

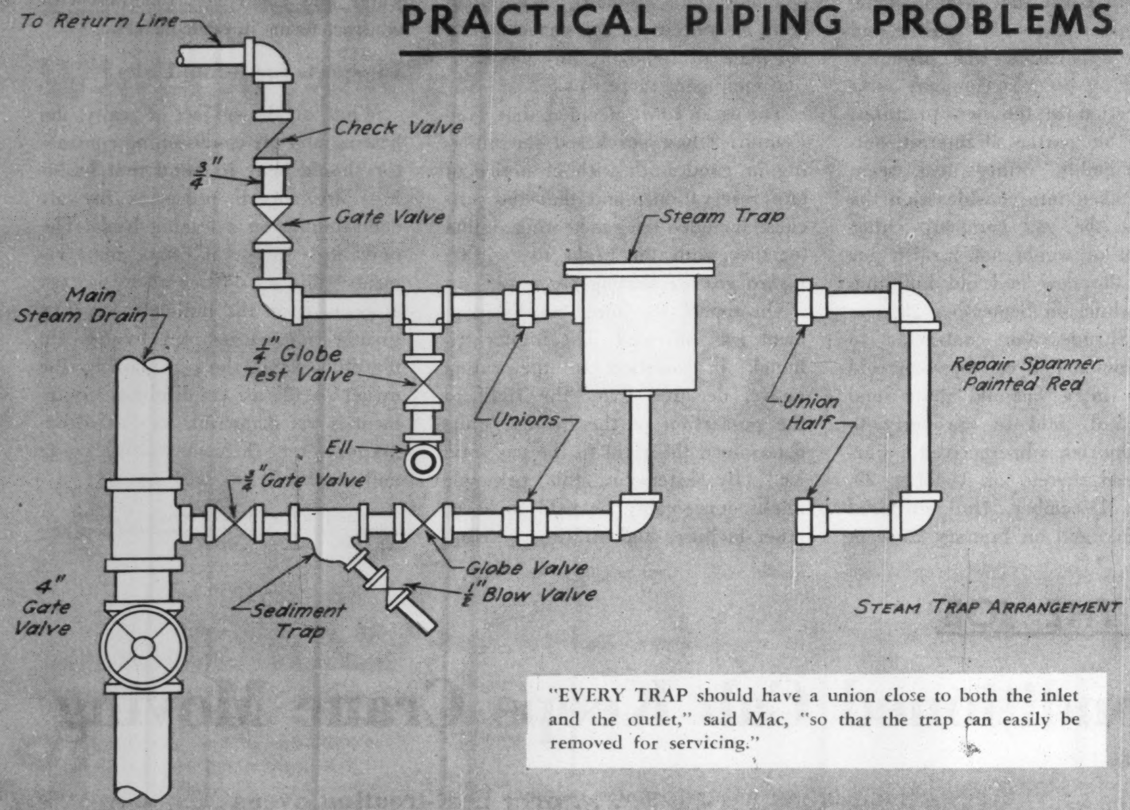


OPERATOR of air conditioned cab is now able to continue working for hours in safety and comfort over 1000 F heat-treating ovens and oil quench bath. Note vertical installation on top

Says Plant Engineer Harold G. Love, after several years of experience, "It is doubtful if present schedules could be maintained without this equipment."

[Photo courtesy Dravo Corp.]

PRACTICAL PIPING PROBLEMS


To Return Line
Check Valve
3/4"
Gate Valve
Steam Trap
Main Steam Drain
1/4" Globe Test Valve
Ell
Unions
Union Half
Repair Spanner Painted Red
3/4" Gate Valve
4" Gate Valve
Sediment Trap
Globe Valve
1/2" Blow Valve

STEAM TRAP ARRANGEMENT

"EVERY TRAP should have a union close to both the inlet and the outlet," said Mac, "so that the trap can easily be removed for servicing."

THE MYSTERY OF

The Missing Valves

. . . Air drainage is important in return line piping

"HELLO, MAC," called Dave Cooper, as he spied the gasket salesman wandering around the corridor of the Webster building.

"Hello, yourself," replied Martin MacVane cheerfully. "How are things going?" Mac had promised to be present for the starting of the new half mile steam line he had helped Dave design to heat the recently purchased Webster building. The line crossed 10 streets with a series of inverted U bends.

"Everything's fine so far," declared the plant engineer. "We got the line going early this morning without a bit of trouble. Sorry you weren't here for the party." He chuckled, "Those 4 in. gates proved to be just the right thing. Mr. Gale could hardly believe so much water would condense in a cold steam line."

The pair walked into the office of the Superior Packing Co., which had recently been moved uptown. Mr. Gale, owner of the company, greeted Mac cordially.

"Glad to see you, Mac. Dave, here, is dancing a fine tune," he said, smiling at his engineer. "His new steam line went into service without a hitch. I'm pretty happy about it myself."

The telephone rang. "Yes," said Mr. Gale into the mouthpiece. With a frown he handed the phone to Dave. "You better look into this, Dave. It's the power house. They think something's wrong with the return line." The return line to the power house followed the same route as the supply from the plant to the building uptown.

Only a Spurt from Return Line

"Hello," said Dave, with an anxious note in his voice. "What's wrong?"

All of the names in this article are fictitious.

By Bill Dopp

• ***Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting part of his present leisure to drawing on his many piping experiences.***

This month, Mr. Dopp's principal character, Martin MacVane, helps diagnose an air plugged steam line and redesign the installation of air relief valves to correct the fault.

He listened intently, then replied, "If spurts of water are all you're getting from that return line, then the condensate pump in the basement can't be delivering. I'm sure it's running, but I'll check. Stand by 'til I call you."

As he hung up, Mr. Gale and Mac observed that a frown had settled upon the usually smiling face of the engineer. "I can't imagine what's wrong with that pump," he said.

"Something haywire, Dave?" Mac asked.

"Yes," replied Dave explosively. "But what?" He strode across the room and placed his hand on the radiator. "Cold as a door knob in December. . . . That's funny," he continued. "I know that pump is running! I can hear it. And certainly we are condensing plenty of steam. Yet the building is still cold."

"What's the situation, exactly?" requested Mr. Gale. He had been rather pleased with the way everything was working out smoothly since purchasing the Webster building and moving the office. Now here was some trouble with the steam system from the plant.

"Pete says that the return line isn't working. They're getting nothing but little spurts of steam and water. Says it's like the outlet of a single trap."

Starting for the door, Dave motioned to Mac. "Let's take a look at that pump, old top. Maybe I'm wrong about it."

As they neared the pump in the basement, both Mac and Dave knew it was running all right. Long before they reached it, the noise indicated that it was not pumping but churning.

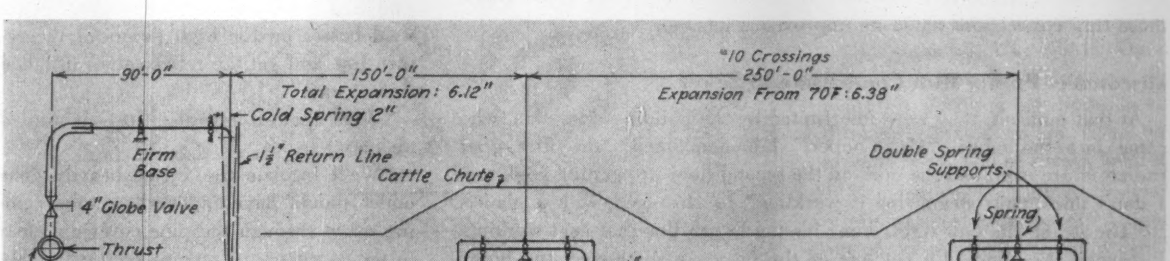
"What in thunder!" exclaimed Dave. He tried the outlet valve to be sure that it was open. Only a little steam was fizzling out. "What do you make of it, Mac?"

"There's a plug of some kind in that return line," declared Mac. "The motor is beginning to run hot, Dave. Better kill the pump."

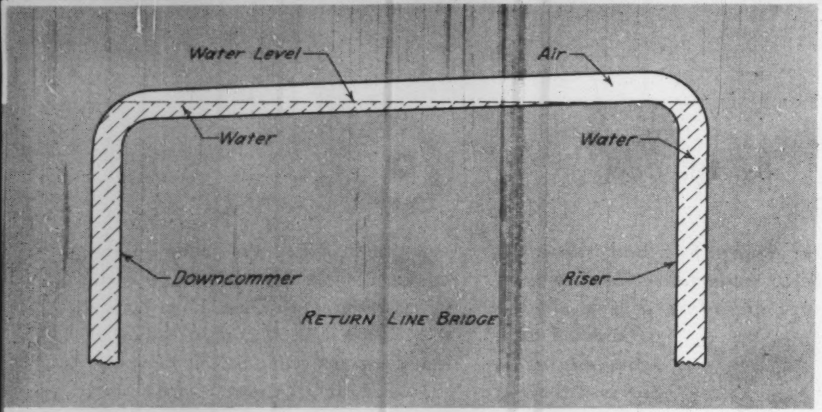
"Right," answered Dave, as he pulled the switch. "I just can't understand how any plug could get into that line. We were very careful.

They walked back to the office in thoughtful silence. "Could be an air plug," suggested Mac casually.

A look of knowledge broke on Dave's face. "Good grief, Mac, what a fool thing to do!" he bellowed. "We forgot to install the air relief valves on those return line bridges!" Then he grinned sheepishly. "Wait 'til Mr. Gale gets wise to this one. I'm in for a ribbing now."


90'-0"
150'-0"
Total Expansion: 6.12"
"10 Crossings
250'-0"
Expansion From 70F: 6.38"
Cold Spring 2"
Firm Base
1½" Return Line
Cattle Chute
Double Spring Supports
Spring
4" Globe Valve
Thrust
Anchor Against Thrust Only
1½" Return Line
4" Steam Line
Firm Base
16'-0"
C.S. ¾"
4" Steam Line
Double Spring Supports
2" Cold Spring
Firm Base
Cold Spring 2" Each Side
60'-0"
Box and Insulate for -20 F
Test Valve
Full Size Drain
Trap
4" os&y Gate
Actual Length: 2650 ft
Developed Length: 3200 ft
Saturated Steam: 160 psig
Return: 100 psig at Pump
Building End
180'-0" From
℄ of Last U-Bend

INVERTED U BENDS in the half mile, 4 in. steam heating line cross 10 streets, are for expansion and drainage



"AS WATER COMES up to the cross line, it runs over to the other end, but traps air above it in the line. As the valley beyond fills up, this air forms a plug which the following water cannot move." Dave sketched with a pencil as he talked.

"How did you ever forget to put air valves in the return?"

Return Omitted from Drawing

"Well, you see," explained Dave hesitatingly "when I made the original drawing, I left out the return line entirely, because I was not sure that we would install it. After our talk that day you were here, I sketched the line in on the print in a hurry. I guess I did a rather poor job, intending to finish the drawing later." In a fading voice he added, "The boys put the line in without any details." Then more firmly, "It's my fault all right, but I did order the valves, though."

"Let's see the drawing again," suggested Mac. "It's too bad that a thing like this had to spoil your party." He unrolled the print and studied it intently. In a moment he pointed with a pencil and said, "You can see here that you are getting only the return from that last trap—possibly only a part of that." He looked up at Dave. "Don't you think you had better open those test valves on the traps that feed back into the return line, so water won't build up in the steam line valleys?"

"I'll get someone out there to open those valves right now," said the engineer eagerly. "Do you think we need to open the 4 in. valves?"

"The line is hot," declared Mac. "If you open the test valves right away, I don't think you will have to touch the big ones. Incidentally, those trap connections could be improved a lot, too."

Disconnect Pump, Run Condensate to Sewer

At that moment, they were interrupted by the building custodian, who came into the office. "Mr. Cooper," he complained, "the first floor radiators are cold, and the ones on the second floor are getting cold, too. I don't think your steam line is working," he shrugged, with a glance.

"The steam line's all right, Tim; it's the return line that isn't working. I stopped the pump. I'll get one of the fitters to disconnect the pump suction and run the condensate to the sewer for the time being. We've got to do some work on the return line before we can use it."

Dave picked up the phone. "Get me Pete Donnelson," he said impatiently. There was a pause. "Hello, Pete. Will you please send someone along that end of the steam line at the power house and have him open all of the test valves on the traps connected into the return line? . . . It's the return line that's blocked by air plugs. The traps discharging into the sewer are all right. Get those valves opened. Pronto, please!"

As Dave replaced the receiver, a quizzical smile passed over his face. Mac turned to see Mr. Gale standing in the doorway.

"What's this?" the old man asked sharply. "Tim says that your system has broken down completely." He eyed the two with good-natured suspicion. "That true?" he asked.

Mac shook his head. "No, Mr. Gale, Dave's having a little difficulty with the return line, but it won't take long to get that fixed up."

Dave put his hand on his friend's shoulder. "Thanks, Mac, but I can take my medicine. The fact is, Mr. Gale, I overlooked putting air relief valves on the return line bridges. So, we've got some very nice air plugs all along that line. It was a bad oversight and makes me look like a fool."

"Don't take it so hard," laughed Mr. Gale. "Do we have to rebuild the whole line?"

"No," replied Dave, starting to sketch with a pencil. "Here is the return line bridge at each of those streets. As water comes up to the cross line, it runs over to the other end, but traps air above it in the line. As the valley beyond fills up, this air will form a plug which the following water cannot move. It simply tends to compress the trapped air. You see, this riser has probably expanded more than the following downcomer. Then, too, we have something of a slight gradient in the line."

All three were bending over the sketch. "That gets to be triangular plug," Mac pointed out. "It can be as effective as if it were cast iron."

"I see," declared Mr. Gale. "What do you intend to do about it?"

Install Air Valves, Insulate

"I've got the valves," answered Dave, who had regained his composure. "We'll weld bosses on the high points of the return line and get the relief valves installed right away."

"What about freezing?" Mr. Gale wanted to know.

"We'll insulate the valves heavily. The outlet should have an overflow tube coming down through the pipe covering, close to the warm return pipe to keep extremely cold air from reaching the inside of the valve." Dave swiftly sketched out his idea as he spoke.

"Do you agree?" Mr. Gale asked Mac.

"Completely," replied Mac. "If that line is properly covered, the water should be warm enough to keep everything from freezing."

"Excuse me, will you, Mac?" asked Dave. "I'm going to get things going. Visit with Mr. Gale for awhile. The lunches are on me," he called as he went out the door.

Check Valve a First Principle

Dave Cooper came back very shortly. "I've got things started to get those air valves on the line. In the meantime, we'll have to waste the water. I've made a sketch of the way to install the air outlet. With two welders working, we should get the job done today." He sat down and looked sharply at Mac. "Now, suppose you explain your remark about improving the trap connections.

"Well," began Mac, "I think that it's a first principle that when you have one line entering another where the pressure could possibly become higher than in the entering line, a check valve should be installed."

Both Dave and Mr. Gale nodded in agreement. Mac went on. "Then, too, every trap should have a union close to both the inlet and the outlet, so that the trap can easily be removed for servicing."

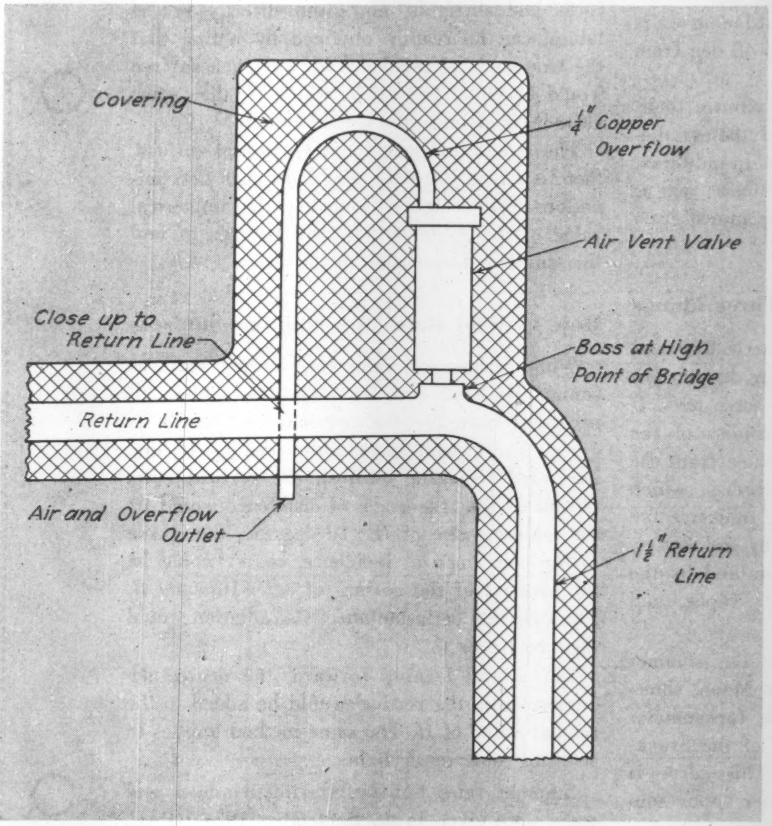
"You once told me something about using a spanner piece to replace a trap that was out of service," remarked Dave. "As I recall it, you had a special connection that fit the two unions on either side of the trap. It was painted red so everyone would know the trap was out."

Dave picked up a pencil and made a rough sketch. "I'm in favor of that, but all of your trap connections would have to be alike to make it practical."

"You can close the valves and let the bypass do the work while the trap is out," suggested Mr. Gale.

Avoid Bypasses Around Traps

"I'm dead against bypasses around traps, Mr. Gale," Mac objected. "I can't repeat that strong enough. I've seen dozens of those things stay open for weeks wasting steam because someone thought a trap wasn't working and opened the bypass valve. Of course, he quickly forgot all about it, and it remained open indefinitely."


Covering
$\frac{1}{4}$" Copper Overflow
Air Vent Valve
Close up to Return Line
Boss at High Point of Bridge
Return Line
Air and Overflow Outlet
$1\frac{1}{2}$" Return Line

"WE'LL WELD BOSSES on the high points of the return line and get the relief valves installed right away," said Dave.

Mac rapped the desk with his pencil. "The steam that is wasted through trap bypasses would buy a lot of new traps. You should have a sediment separator on the trap inlet, and a globe valve in place of the inlet gate."

"Why a globe valve, Mac?" demanded Dave.

"Just getting back to first principles again, Dave," asserted Mac. "If you put a spanner in place of that trap, you would temporarily construct Mr. Gale's bypass. So, you would have to throttle the gate, or leave the line wide open. No gate should ever be used as a throttle valve.

"It's a first principle, too, that all equipment should be protected against dirt and foreign matter in the line. Therefore, the sediment trap is there." Mac's pencil was busy while he talked. "Try connecting your trap lines like this, Dave. They'll be trouble-free indefinitely and easy to service when the steam traps need it."

"I guess Mac's right, Dave," laughed Mr. Gale. "How he does insist on plugging up holes in our thinking! It's good to have you around, Mac. You're always helpful."

Mac replied, "It's up to designers of piping to get every bit of efficiency out of their installations that can be delivered. We can do this only by giving careful thought to everything."

He got up and stretched. "The smallest pipe line can cause a Niagara of trouble and expense."

"Like a $1\frac{1}{2}$ in. return line gumming up the work of a 4 in. steam line?" Dave suggested, laughingly.

"I'll be back next week to see your heating system in perfect working order," promised Mac as he got up to leave. "Tell Tim I said so," he grinned as he departed.

Solar Irradiation

east or west facing walls and windows — from May through September

By R. F. Quan* and F. W. Hutchinson**

• How much does the sun's irradiation affect the cooling load of a building? You can save time and work in calculating this by using these tables. With them, you can quickly find the angle of incidence and the irradiation rate for any wall facing in any direction from east through south to west, for every hour of every month.

AIR CONDITIONING engineers frequently need precise information on the rate at which solar energy will strike a given structure. This article provides solutions for east- or west-facing walls or windows in latitudes from 30 to 45 deg from May to September.

Also furnished is data for approximate interpolation of the solar position and the irradiation rates at intermediate angles. In addition, irradiation on slanting and horizontal as well as vertical surfaces can be simply determined from the data supplied.

Normal Intensity Depends on Three Things

The normal intensity, I_o, is numerically equal to the Btu per hr which, on a clear day, strikes 1 sq ft of surface normal to the sun's rays. It depends on three things: the turbidity of the earth's atmosphere, the sun's distance from the earth and the solar altitude. Turbidity, which varies with weather and locality, indicates the depletion of solar energy caused by the scattering effect of dust and water vapor and by the absorption effect of ozone, water vapor, and carbon dioxide.

In obtaining values of I_o for the summer tables a curve prepared by Parry Moon, showin I_o in relation to solar altitude for summer conditions was used [see Journal of the Franklin Institute, November 1940]. This curve is based on a fixed value of the water vapor content and on a dust concentration of 300 particles per cu ft, each particle 1 micron in size.

How to Correct for Cloudiness

During periods of partially obscured or intermittent sunshine, the actual rate of irradiation will be less than the tabular values for clear days. Where exact data is required, the clear-weather values may be multiplied by the percent of maximum possible sunshine — a coefficient obtainable from Weather Bureau records for each locality — and then reduced to 60 percent as an arbitrary correction.

How to Find Horizontal Irradiation Rates

Irradiation rates for horizontal surfaces, like roofs and skylights, not given directly in the tables, can be readily obtained by noting that the true angle of incidence for any such surface would be equal to $90-H$, where H, the solar altitude, is given in the second column.

The irradiation rate for a horizontal surface, then, is $I_o \cos (90-H)$. For most such determinations the designer, knowing the numerical value of the angle $90-H$, will be able to find this angle and its cosine in the tables.

How to Find Rates for Slanting Surfaces

While irradiation rates for slanting surfaces cannot be read directly from the tables, all necessary data for the requisite calculation is given. For a wall or window leaning 10 deg backward from the vertical, the vertical component of the true angle of incidence would be the tabular value of $H-10$ deg. So, the cosine of the true angle of incidence, $\cos i'$, would be the product of the cosines of $(H-10)$ and B. The true rate of instantaneous irradiation would then be $I_o \cos i'$.

For a wall leaning forward, the degree departure from the vertical would be added to the tabular value of H. The same method applies to slanting roofs or skylights.

Summer rates for south-facing windows and walls were given in the September 1954 HPAC. For irradiation rates in winter see HPAC, July 1949; December 1950; and May 1951.

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*Associate Mechanical Engineer, California State Harbor Board.

**Professor of Mechanical Engineering, University of California.

TABLE 5a

East or West Wall

Latitude 30°

Solar Time	Solar Altitude H	Azimuth A	B= A−90	cos H	cos B	cos i	i	Normal Intensity I_o	I_o cos i
May									
EAST WEST									
6am, 6pm	10	73	−17	0.9848	0.9563	0.9418	19.65	107.5	101.24
7am, 5pm	22	79	−11	0.9272	0.9816	0.9101	24.49	207.2	188.57
8am, 4pm	36	86	− 4	0.8090	0.9976	0.8071	36.19	252.2	203.55
9am, 3pm	48	93	3	0.5691	0.9986	0.6682	48.06	273.4	182.68
10am, 2pm	61	103	13	0.4848	0.9744	0.4724	61.81	285.5	134.87
11am, 1pm	73	123	33	0.2924	0.8387	0.2452	75.80	291.3	71.43
12 Noon	80	180	90	0.1737	0	—	—	—	—
June									
6am, 6pm	13	70	−20	0.9744	0.9397	0.9156	23.71	149.9	137.25
7am, 5pm	31	79	−11	0.8572	0.9816	0.8414	32.72	237.9	200.17
8am, 4pm	37	82	− 8	0.7986	0.9903	0.7909	37.77	254.6	201.36
9am, 3pm	51	89	− 1	0.6293	0.9999	0.6292	51.00	276.9	174.22
10am, 2pm	63	97	7	0.4540	0.9926	0.4506	63.23	286.7	129.19
11am, 1pm	76	114	24	0.2419	0.9136	0.2210	77.23	292.2	64.57
12 Noon	84	180	90	0.1045	0	—	—	—	—
July									
6am, 6pm	10	72	−18	0.9848	0.9511	0.9366	20.52	107.5	100.68
7am, 5pm	22	78	−12	0.9272	0.9782	0.9070	24.90	207.2	187.93
8am, 4pm	36	85	− 5	0.8090	0.9962	0.8059	36.30	252.2	203.25
9am, 3pm	48	92	2	0.6691	0.9994	0.6687	48.03	273.4	182.82
10am, 2pm	61	102	12	0.4848	0.9782	0.4742	65.70	285.5	135.38
11am, 1pm	73	120	30	0.2924	0.8660	0.2532	75.33	291.3	73.76
12 Noon	80	180	90	0.1737	0	—	—	—	—
August									
6am, 6pm	7	79	−11	0.9926	0.9816	0.9743	13.02	69.0	67.00
7am, 5pm	21	87	− 3	0.9336	0.9986	0.9323	21.20	202.8	189.07
8am, 4pm	32	94	4	0.8480	0.9976	0.8460	32.22	241.0	203.89
9am, 3pm	46	103	13	0.6947	0.9744	0.6769	47.40	270.4	183.03
10am, 2pm	57	116	26	0.5446	0.8988	0.4895	60.70	282.5	138.28
11am, 1pm	68	139	49	0.3746	0.6561	0.2458	75.76	289.4	71.13
12 Noon	72	180	90	0.3090	0	—	—	—	—
September									
6am, 6pm	5	89	− 1	0.9962	0.9999	0.9961	5.05	56.0	55.78
7am, 5pm	14	97	7	0.9703	0.9926	0.9631	15.62	157.0	151.20
8am, 4pm	26	105	15	0.8988	0.9659	0.8682	29.74	223.0	193.61
9am, 3pm	39	116	26	0.7772	0.8988	0.6985	45.69	258.9	180.84
10am, 2pm	49	130	40	0.6561	0.7660	0.4330	64.35	274.6	118.90
11am, 1pm	58	151	61	0.5299	0.4848	0.2569	75.11	283.3	72.78
12 Noon	61	180	90	0.4848	0	—	—	—	—

TABLE 6a

East or West Wall

Latitude 35°

Solar Time	Solar Altitude H	Azimuth A	B= A−90	cos H	cos B	cos i	i	Normal Intensity I_o	I_o cos i
May									
EAST WEST									
6am, 6pm	12	73	−17	0.9782	0.9563	0.9355	20.69	133.5	124.89
7am, 5pm	23	81	− 9	0.9205	0.9877	0.9136	24.99	211.6	193.32
8am, 4pm	36	89	− 1	0.8090	0.9999	0.8089	36.01	252.2	204.00
9am, 3pm	49	99	9	0.6561	0.9877	0.6480	49.61	274.6	177.94
10am, 2pm	60	112	22	0.5000	0.9272	0.4636	62.42	284.8	132.03
11am, 1pm	70	135	45	0.3420	0.7071	0.2418	76.00	290.2	70.17
12 Noon	75	180	90	0.2588	0	—	—	—	—
June									
6am, 6pm	14	71	−19	0.9703	0.9455	0.9174	23.46	157.0	144.03
7am, 5pm	26	78	−12	0.8988	0.9782	0.8792	28.45	223.0	196.06
8am, 4pm	38	86	− 4	0.7880	0.9976	0.7861	38.18	256.7	201.79
9am, 3pm	51	95	5	0.6293	0.9962	0.6269	51.18	276.9	173.59
10am, 2pm	63	107	17	0.4540	0.9563	0.4342	64.26	286.7	124.48
11am, 1pm	73	129	39	0.2924	0.7772	0.2272	76.85	291.3	66.18
12 Noon	78	180	90	0.2079	0	—	—	—	—
July									
6am, 6pm	12	73	−17	0.9782	0.9563	0.9356	20.67	133.5	124.90
7am, 5pm	22	80	−10	0.9272	0.9848	0.9131	24.05	207.2	189.19
8am, 4pm	35	88	− 2	0.8192	0.9994	0.8187	35.06	249.8	204.81
9am, 3pm	47	97	7	0.6820	0.9926	0.6769	47.40	272.1	184.18
10am, 2pm	59	110	20	0.5150	0.9397	0.4839	61.16	284.1	137.47
11am, 1pm	70	133	43	0.3420	0.7314	0.2511	75.44	290.2	72.87
12 Noon	76	180	90	0.2419	0	—	—	—	—
August									
6am, 6pm	8	80	−10	0.9903	0.9848	0.9752	12.75	83.5	81.43
7am, 5pm	19	88	− 2	0.9455	0.9994	0.9449	19.10	189.8	179.34
8am, 4pm	32	97	7	0.8480	0.9926	0.8417	31.68	241.0	202.84
9am, 3pm	44	108	18	0.7193	0.9511	0.6841	46.83	267.7	183.13
10am, 2pm	56	123	33	0.5592	0.8387	0.4690	62.03	281.6	132.07
11am, 1pm	64	145	55	0.4384	0.5736	0.2515	75.43	287.2	72.23
12 Noon	68	180	90	0.3746	0	—	—	—	—
September									
6am, 6pm	5	89	− 1	0.9962	0.9999	0.9961	5.05	56.0	55.78
7am, 5pm	14	98	8	0.9703	0.9903	0.9609	16.09	157.0	150.81
8am, 4pm	26	107	17	0.8988	0.9563	0.8595	30.75	223.0	191.67
9am, 3pm	39	119	29	0.7772	0.8746	0.6797	47.12	258.9	175.97
10am, 2pm	48	134	44	0.6691	0.7193	0.4813	61.23	273.4	131.59
11am, 1pm	55	154	64	0.5736	0.4384	0.2515	75.43	280.8	70.62
12 Noon	58	180	90	0.5299	0	—	—	—	—

TABLE 7a

East or West Wall — Latitude 40°

Solar Time	Solar Altitude H	Azimuth A	B = A−90	cos H	cos B	cos i	i	Normal Intensity I_0	$I_0 \cos i$
May EAST WEST									
6am, 6pm	13	74	−16	0.9744	0.9613	0.9367	20.50	149.9	140.41
7am, 5pm	23	83	− 7	0.9205	0.9926	0.9137	23.96	211.6	193.34
8am, 4pm	35	93	3	0.8192	0.9986	0.8181	35.10	249.8	204.36
9am, 3pm	47	104	14	0.6820	0.9703	0.6617	48.56	272.1	180.04
10am, 2pm	57	119	29	0.5446	0.8746	0.4763	61.55	282.5	134.55
11am, 1pm	66	143	53	0.4067	0.6018	0.2448	75.85	288.3	70.57
12 Noon	70	180	90	0.3420	0	—	—	—	—
June									
6am, 6pm	15	72	−18	0.9659	0.9511	0.9187	23.25	165.2	151.76
7am, 5pm	27	81	− 9	0.8910	0.9877	0.8800	28.36	226.5	199.32
8am, 4pm	38	90	0	0.7880	1.0000	0.7880	38.00	256.7	202.38
9am, 3pm	50	100	10	0.6428	0.9848	0.6330	50.73	275.8	174.58
10am, 2pm	61	115	25	0.4848	0.9063	0.4394	63.93	285.5	125.45
11am, 1pm	69	139	49	0.3584	0.6561	0.2351	76.41	289.8	68.13
12 Noon	74	180	90	0.2756	0	—	—	—	—
July									
6am, 6pm	13	74	−16	0.9744	0.9613	0.9367	20.50	149.9	140.41
7am, 5pm	24	82	− 8	0.9136	0.9903	0.9047	25.21	215.0	194.51
8am, 4pm	36	92	2	0.8090	0.9994	0.8085	36.05	252.2	203.90
9am, 3pm	47	103	13	0.6820	0.9744	0.6645	48.35	272.1	180.81
10am, 2pm	58	118	28	0.5299	0.8830	0.4679	62.10	283.3	132.55
11am, 1pm	67	142	52	0.3907	0.6157	0.2406	76.02	288.9	69.51
12 Noon	71	180	90	0.3256	0	—	—	—	—
August									
6am, 6pm	9	81	− 9	0.9877	0.9877	0.9756	12.68	98.0	95.61
7am, 5pm	20	90	0	0.9397	1.0000	0.9397	20.00	196.3	184.46
8am, 4pm	31	100	10	0.8572	0.9848	0.8442	32.41	237.9	200.83
9am, 3pm	42	112	22	0.7431	0.9272	0.6890	46.45	264.4	182.17
10am, 2pm	52	128	38	0.6157	0.7880	0.4852	60.97	278.9	135.32
11am, 1pm	59	151	61	0.5150	0.4848	0.2493	75.56	284.1	70.83
12 Noon	63	180	90	0.4540	0	—	—	—	—
September									
6am, 6pm	5	89	− 1	0.9962	0.9999	0.9961	5.05	56.0	55.78
7am, 5pm	12	99	9	0.9782	0.9877	0.9662	14.95	133.5	128.99
8am, 4pm	24	110	20	0.9136	0.9397	0.9192	23.19	215.6	198.18
9am, 3pm	34	122	32	0.8290	0.8481	0.7031	45.32	247.0	173.66
10am, 2pm	42	137	47	0.7431	0.6820	0.5068	59.55	264.5	134.05
11am, 1pm	49	157	67	0.6561	0.3907	0.2563	75.15	274.6	70.38
12 Noon	51	180	90	0.6293	0	—	—	—	—

TABLE 8a

East or West Wall — Latitude 45°

Solar Time	Solar Altitude H	Azimuth A	B = A−90	cos H	cos B	cos i	i	Normal Intensity I_0	$I_0 \cos i$
May EAST WEST									
6am, 6pm	14	76	−14	0.9703	0.9703	0.9415	19.70	157.0	147.81
7am, 5pm	25	86	− 4	0.9063	0.9976	0.9041	25.30	219.6	198.54
8am, 4pm	35	96	6	0.8192	0.9945	0.8147	35.46	249.8	203.51
9am, 3pm	45	109	19	0.7071	0.9455	0.6403	50.18	269.3	172.43
10am, 2pm	55	125	35	0.5736	0.8192	0.4699	61.97	280.8	131.95
11am, 1pm	62	149	59	0.4695	0.5150	0.2418	76.00	286.1	69.79
12 Noon	65	180	90	0.4226	0	—	—	—	—
June									
6am, 6pm	16	73	−17	0.9613	0.9563	0.9193	23.17	172.1	158.21
7am, 5pm	27	83	− 7	0.8910	0.9926	0.8840	27.87	226.5	200.22
8am, 4pm	38	94	4	0.7880	0.9976	0.7861	38.12	256.7	201.79
9am, 3pm	48	106	16	0.6691	0.9613	0.6432	49.96	273.4	175.85
10am, 2pm	58	122	32	0.5299	0.8481	0.4494	63.30	283.3	127.32
11am, 1pm	65	146	56	0.4226	0.5592	0.2363	76.36	287.8	68.01
12 Noon	69	180	90	0.3584	0	—	—	—	—
July									
6am, 6pm	14	75	−15	0.9703	0.9659	0.9372	20.41	157.0	147.14
7am, 5pm	25	85	− 5	0.9063	0.9962	0.9666	14.85	219.6	212.26
8am, 4pm	35	95	5	0.8192	0.9962	0.8161	35.30	249.8	203.86
9am, 3pm	46	108	18	0.6947	0.9511	0.6607	48.65	270.4	178.65
10am, 2pm	54	124	34	0.5878	0.8290	0.4873	60.83	279.9	136.39
11am, 1pm	63	148	58	0.4540	0.5299	0.2406	76.02	286.7	68.98
12 Noon	66	180	90	0.4067	0	—	—	—	—
August									
6am, 6pm	9	81	− 9	0.9877	0.9877	0.9756	12.68	98.0	95.61
7am, 5pm	20	92	2	0.9397	0.9994	0.9391	20.10	196.3	184.34
8am, 4pm	30	103	13	0.8660	0.9744	0.8438	32.45	235.1	198.38
9am, 3pm	40	116	26	0.7660	0.8988	0.6885	46.49	260.4	179.28
10am, 2pm	49	133	43	0.6561	0.7314	0.4799	61.32	274.6	131.78
11am, 1pm	55	154	64	0.5736	0.4384	0.2515	17.43	280.8	70.62
12 Noon	58	180	90	0.5299	0	—	—	—	—
September									
6am, 6pm	5	89	− 1	0.9962	0.9999	0.9961	5.05	56.0	55.78
7am, 5pm	11	100	10	0.9816	0.9848	0.9667	14.82	117.0	113.10
8am, 4pm	22	112	22	0.9272	0.9272	0.8597	30.72	207.2	178.13
9am, 3pm	31	125	35	0.8572	0.8192	0.7022	45.40	237.9	167.05
10am, 2pm	39	140	50	0.7772	0.6428	0.4996	60.03	258.9	129.35
11am, 1pm	44	159	69	0.7193	0.3584	0.2578	75.06	267.7	69.01
12 Noon	46	180	90	0.6947	0	—	—	—	—

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Selection of Outside Design Temperature for Heat Load Estimation

By M. L. Ghai* and R. Sundaram, New Delhi, India**

SUMMARY — The paper presents a method for accurate estimation of the heat load caused by heat transfer through homogeneous surfaces due to difference between outside and inside air temperatures. The proposed method uses an equation to calculate an equivalent outside design temperature which takes into account both the local weather conditions and the characteristics of the building materials. This gives the actual heat transfer produced by the combined effect of periodic heat transmission and steady state heat transmission.

The equivalent outside design temperature, t_D can be used with the equation of the form

$$q = UA(t_D - t_i)$$

to compute the actual heat transfer.

The method of determining t_D is given. It is obtained by solving an equation in which known values of maximum (or minimum) and mean temperatures from local weather records, and the material characteristics (density, specific heat, thickness, and conductivity) are substituted. For cooling, the design temperature t_D lies between the daily maximum and daily mean temperatures. For heating t_D lies between the daily minimum and daily mean temperatures.

THE FIRST step in the air conditioning of a building is to estimate its heating or cooling load. Since this is an important basic step, several methods have been developed in the past few decades to improve the accuracy with which the heating or cooling load of a building can be predicted. This paper is devoted to the development of a rational, accurate, and yet simple method for the determination of the heat transmitted through barriers due to difference in outside and inside air temperatures.

This transmitted heat is generally estimated from the simple equation

$$q = UA\ (t_o - t_i)\ \ldots\ldots\ldots\ldots (1)$$

where

U = the coefficient of heat transmission.

t_i = inside constant temperature, Fahrenheit.

t_o = outside temperature, Fahrenheit.

It is evident that the outside temperature, or the outside design temperature as it is sometimes called, should be selected carefully so that Equation 1 will give the true heat transmission.

Before presenting the proposed method for selecting the outside temperature for use in Equation 1, it may be desirable to review briefly the basic factors which determine heat transfer through the building barriers.

Factors Determining Maximum Heat Transmission

Equation 1 for steady-state heat transfer is used in practice because of its simplicity. It does not represent the true condition because the actual heat transfer is non-steady due

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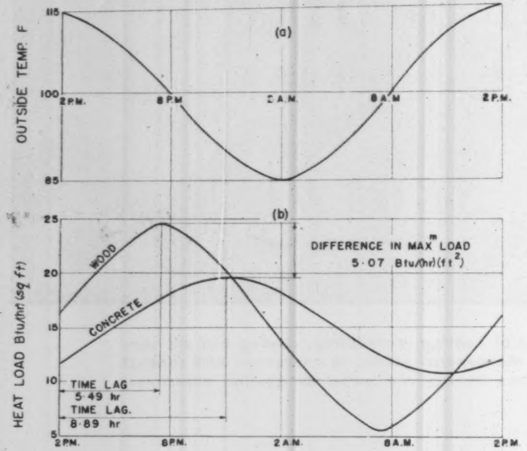


Fig. 1—(*a*) Outside temperature variation; (*b*) Heat load *vs.* time, for barriers of concrete and wood of same coefficient of heat transmission, without considering the air films

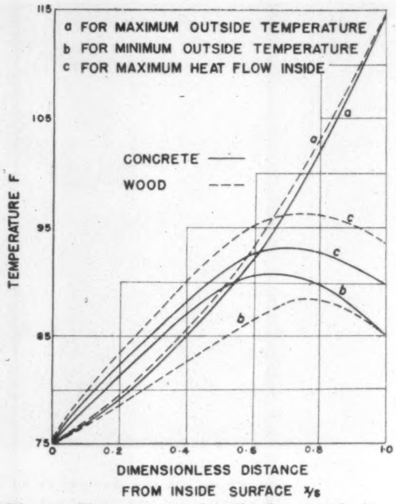


Fig. 2—Temperature distribution inside barriers of concrete and wood having same coefficient of heat transmission, for maximum and minimum conditions

to varying outside temperature. As a result, the extent to which the outside temperature affects the cooling load of a barrier depends not only on the *U* factor (transmittance) of the barrier but also on the characteristics of the building materials.

Consider, for instance, two walls each having a *U* value of 0.42: (1) an 18-in. thick concrete wall and (2) a 1.26-in. thick wood wall. Both are exposed on the outside to the temperature variation of Fig. 1, diagram (a), and on the inside to a constant temperature of 75 F. Fig. 2 gives the temperature distribution in the walls at three instants: when the outside temperature is maximum, when it is minimum, and when the heat flow to the inside is maximum. The slope of the temperature curves at the inner surface gives the heat flow to the inside, as shown in Fig. 1, diagram (b). The curves illustrate two well-known facts: (1) the maximum heat flow to the inside does not take place at the time when the outside temperature is maximum, but instead lags behind the outside temperature. The time lag for the concrete wall is larger. The outside maximum temperatures lasting for a short duration are, therefore, of less importance in the concrete wall and (2) the maximum heat transmittance is less for the concrete wall, even though the *U* value for the two walls and the outside weather conditions are the same. According to Equation 1, it would be concluded that two walls having the same *U* value and exposed to the same outside environment would have equal heat load.

It is thus necessary in developing a rational procedure for estimating heat load to take into account (1) the local weather conditions and (2) the characteristics of building materials and construction.

Present Methods

The basis of the presently used methods is summarized in the section on design outdoor conditions in the HEATING, VENTILATING, AIR CONDITIONING GUIDE 1954 as follows: *There are no hard and fast rules for selecting the design outdoor weather conditions to be used for a given locality or type of building or heating system, and the selection is to some extent a matter of judgment and experience.*

For estimating heating load, it has been recommended by the ASHVE Technical Advisory Committee on Weather Design Conditions that the outside design temperature be the temperature equalled or exceeded during 97½ percent of the hours in December, January, February and March for the period of record. The recommendation for the cooling load estimate by the same committee is that the outside design temperature should be the maximum hourly temperature which has been equalled or exceeded 2½ percent of the total hours of June, July, August and September, for the period of record.

A common feature of the methods used at present is that the outside design temperature is fixed on the basis of the local weather data only, and consequently systems for all buildings in a particular locality are designed on the basis of the same outside temperature, irrespective of the variation in the characteristics of the building materials or construction. By excluding temperatures lasting for less than three hours or temperatures which have not been equalled or exceeded 2½ percent of the total hours, some consideration is given to the fact that the temperatures lasting for a short duration do not have their full effect on the building (since it takes time for the heat to penetrate the barrier). It is evident, however, that different buildings would be affected differently.

Analytical equations are available for precise calculation of the periodic heat flow through barriers. However, these equations involve elaborate and time-consuming mathematical calculations, and are rarely

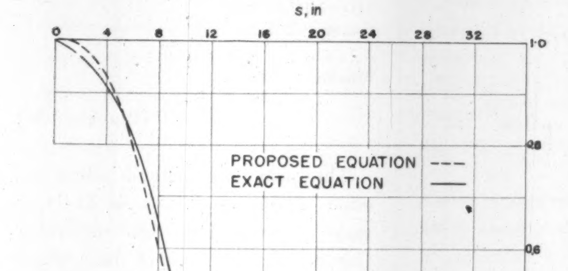


Fig. 3—Ω *vs.* *s*, for concrete and brick

used by the engineer in the field. The authors have therefore tried to develop an equation having the requisite of simplicity and a reasonable amount of accuracy for computation of the correct heat transmission under periodic heat flow conditions.

Proposed Equation for Cooling

If the outside design temperature, t_D, is defined as a fictitious constant temperature which produces the same amount of maximum heat transmission at the inner surface of the barrier as is produced by the actual varying outside temperature, the heat load can then be calculated from the simple steady-state equation by substituting t_D in Equation 1 for the outside temperature

$$q = UA.(t_D - t_i) \quad \ldots\ldots\ldots\ldots(2)$$

Adopting this definition of t_D, it is shown in Appendixes A and B that the outside design temperature, t_D, may be calculated from the following equation:

$$(t_{max} - t_D)/(t_D - t_m) = F \quad \ldots.(3)$$

where

$$F = 0.0007X^2(1+2Y\sqrt{Y})$$

X = ρcs
Y = $(1/k)s$
t_{max} = daily maximum outside temperature, Fahrenheit.
t_m = daily mean outside temperature, Fahrenheit.
k = thermal conductivity, Btu per (square foot) (hour) (Fahrenheit degree per foot).
ρ = density, pounds per cubic foot.
c = specific heat, Btu per (pound) (Fahrenheit degree).
s = thickness of the barrier, feet.

The left-hand side of the equation depends on the outside temperature variation — that is, on the local weather conditions. The right-hand side of the equation represents the effect of the construction and the materials — that is, characteristics of the particular building under consideration.

For a very thick barrier, the right-hand side approaches infinity, where $t_D = t_m$. The design temperature of a very thick barrier should, therefore, be taken equal to the daily mean temperature. For a thin barrier, the right-hand side approaches zero, where $t_D = t_{max}$. The design temperature for a very thin barrier should, therefore, be taken equal to the daily maximum temperature. In any particular locality with given t_{max} and t_m, when the thickness, density, or specific heat of the barrier increases and the thermal conductivity decreases, the right-hand factor becomes larger, and the design temperature becomes smaller. The daily mean temperature is the lower limiting value.

The calculation of the right-hand side of the equation requires data on the properties of construction materials. Such data can be obtained from any appropriate hand-book. The left-hand side requires the typi-

Nomenclature

A = area of surface, square feet.
c = specific heat, Btu per (pound) (Fahrenheit degree).
k = thermal conductivity, Btu per (square foot) (hour) (Fahrenheit degree per foot).
N_{Fo} = Fourier Number, $a\tau/s^2$
N_{Nu} = Nusselt Number, hs/k
q = rate of flow, Btu per (hour) (square foot) Fahrenheit degree).
s = thickness of the barrier, feet.
t = temperature, Fahrenheit.
t_D = equivalent outdoor design temperature, Fahrenheit.
t_i = inside constant temperature, Fahrenheit.
t_m = daily mean outside temperature, Fahrenheit.
t_{max} = daily maximum outside temperature, Fahrenheit.
t_{min} = daily minimum outside temperature, Fahrenheit.
t_o = outside temperature, Fahrenheit.
t_1 = amplitude of daily temperature variation, Fahrenheit degrees.
U = overall heat transfer (air to air), Btu per (hour) (square foot) (Fahrenheit degree difference in temperature).
x = distance from the inside surface of the barrier, feet.
a = thermal diffusivity, square feet per hour.
ρ = density, pounds per cubic foot.
τ = time, hours.
τ_c = time needed for one full cycle, hours.
Ω = decrement factor for amplitude of temperature variation.

cally high daily maximum and daily mean temperatures to be expected in the locality under consideration.

To illustrate the use of the proposed equation, let it be required to determine the outside design temperature for the 18-in. thick concrete barrier and 1.26-in. thick wood barrier (mentioned earlier in this paper) in a locality where the daily maximum and mean temperatures are 115 F and 100 F, respectively. Further, let it be required to calculate the maximum cooling loads for the two barriers, the overall coefficient of heat transmission for both the barriers being 0.42 Btu per (hr) (sq ft) (F deg), and the inside temperature being 75 F.

For the concrete wall

$\rho c = 30,\ 1/k = 1$, and
$s = 18/12 = 1.5$
$X = 30 \times 1.5 = 45$
$Y = 1 \times 1.5 = 1.5$

$$F = 0.0007X^2(1+2Y\sqrt{Y}) = 6.59$$

$(t_{max} - t_D)/(t_D - t_m) =$
$(115 - t_D)/(t_D - 100) = 6.59$,

giving

$t_D = 101.98$ F
Maximum heat
transfer $= 0.42(101.98-75)$
$= 11.3$ Btu per (hr) (sq ft)

For the wood wall

$\rho c = 17.5,\ 1/k = 14.3$, and $s = 1.26/12 = 0.11$
$X = 17.5 \times 0.11 = 1.89 \quad Y = 14.3 \times 0.11 = 1.5$

$$F = 0.0007X^2(1+2Y\sqrt{Y}) = 0.01$$

$(t_{max} - t_D)/(t_D - t_m) = (115 - t_D)/(t_D - 100) = 0.01$,

giving

$t_D = 114.85$ F
Maximum heat
transfer $= 0.42(114.85 - 75)$
$= 16.7$ Btu per (hr) (sq ft)

The maximum heat load for the wood wall is about 48 percent higher than that of the concrete wall, although the coefficient of heat transmission is the same. These walls are of course somewhat extreme cases of construction.

Proposed Equation for Heating

Equation 3 for cooling can also be applied to heating of buildings, after slight modification. For heating, the equation becomes:

$$\frac{t_{min}-t_D}{t_D-t_m} = 0.0007X^2(1+2Y\sqrt{Y}) \text{-----} (4)$$

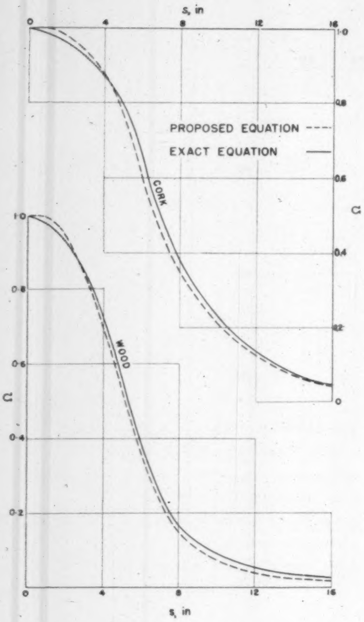


Fig. 4—Ω *vs. s*, for wood and cork

Only the t_{max} of the equation for cooling is replaced by t_{min} when it is used for heating. It is quite evident that for cooling the maximum outside temperature, t_{max}, is important while for heating the minimum outside temperature, t_{min}, is important. In case of heating, the design temperature, t_D, lies between the daily minimum and the daily mean temperature. For thick structures of heavy materials t_D is close to t_m, while for thin structures of light materials t_D approaches t_{min}.

To illustrate, consider that the walls of wood and concrete used in the previous examples are situated in a locality where the daily mean and minimum temperatures are 0 F and −15 F respectively.

For the concrete wall,

$(t_{min} - t_D)/(t_D - t_m) = (-15 - t_D)/(t_D - 0) = 6.59$

hence

$t_D = 1.98$ F
Maximum heat
transfer $= 0.42(-1.98 - 75)$
$= -32.3$ Btu per (hr) (sq ft)

For the wood wall,

$(t_{min} - t_D)/(t_D - t_m) = (-15 - t_D)/(t_D - 0) = 0.01$

hence

$t_D = -14.25$ F
Maximum heat
transfer $= 0.42(-14.85 - 75)$
$= -37.7$ Btu per (hr) (sq ft)

The proposed method offers another advantage which is likely to make it convenient and desirable. One reason why none of the methods for determining design temperature has been universally accepted in practice is that they require detailed weather data, collection of which is expensive and time consuming. For instance, if the design temperature for a locality is to be determined from hourly records, it is necessary to have a complete hourly temperature record for every day during a period of 10 years. The method proposed in this paper does not require the hourly temperatures; it requires only the daily maximum and minimum temperatures which are relatively easy to obtain.

Although the proposed method overcomes the difficulty of collecting hourly temperatures, it still incorporates a factor which must be fixed somewhat arbitrarily by the individual designer until a standardized procedure is established. It is necessary to decide whether the daily maximum and mean temperatures are to be taken as the maximum in a year, or as an average of such temperatures in 5, 10, or 20 years.

Assumptions and Accuracy

The proposed equations for heating and cooling are based on the commonly used film coefficients, 1.65 for inside and 4.0 for outside. The actual outside temperature variation has been taken as a single sinusoidal function of time. Also, it may be pointed out that these equations give a basis for selection of outside design temperature making allowance for the periodic variation of outside temperature, and are to be used *for the calculation of transmission heat losses only*. The heat load due to solar radiation, and other causes should be estimated separately.

The accuracy of the proposed Equations 3 and 4 has been indicated in Figs. 3 and 4. The effect of the building construction and materials is represented by a factor, Ω, which is given by,

$$\Omega=\frac{1}{1+0.0007X^{2}(1+Y\sqrt{Y})}$$

or

$$t_D = t_m + \Omega\ t_1$$

or $$\Omega = (t_D - t_m)/(t_{max} - t_m)$$

In Figs. 3 and 4, values of Ω obtained from the proposed equations have been compared with the values obtained from exact mathematical equations (for details see Appendixes A and B). The comparison has been made for barriers of various thicknesses and different commonly used materials (concrete, brick, wood, cork). For thick heavy walls, Ω approaches zero; the design temperature should be close to the daily mean temperature. For thin light walls, Ω approaches one; the design temperature should be close to the daily maximum temperature in summer or daily minimum temperature in winter. Another interesting feature of the curves is their shape. As s increases, Ω at first decreases gradually, then rapidly, and then again slowly. This indicates the economical thickness of the barriers. For instance, in case of brick walls, when s increases from 4 in. to 16 in. Ω decreases from 0.91 to 0.15, *i.e.*, by 0.76; but when s increases from 16 to 28 in. Ω decreases from 0.15 to 0.02, *i.e.*, by only 0.13. The curves indicate that an increase of thickness beyond about 20 in. for concrete, 16 in. for brick, 8 in. for wood, and 10 in. for cork, obtains much smaller returns in the form of savings in heat transfer than corresponding increases of thickness for thinner walls.

The present paper deals only with homogeneous constructions. The application of the proposed method to multilayer constructions is being considered.

APPENDIX A

Derivation of the Equation for Outside Design Temperature without Considering the Air Films

Let the outside temperature, t_o, vary periodically according to the equation:

$$t_o = t_m + t_1 \cos\left[2\pi\ (\tau/\tau_c)\right] \ldots\ldots (A\text{-}1)$$

where t_m and t_1 are the daily mean temperature, and the amplitude of the daily temperature variation respectively.

The analysis is carried out for a single sinusoidal function only, recognizing that, for all practical purposes, the actual daily temperature variation may be assumed to be close to a single sinusoidal function. For precise results, exact analysis may be made by expressing the daily temperature variation as a Fourier series, using methods of harmonic analysis, and treating separately each term of the series in a similar manner.

The solution of the Fourier-Poisson's equation,

$$\partial t/\partial\tau = a\ (\partial^2 t/\partial x^2),$$

gives the temperature distribution and the temperature gradient inside the barrier. The maximum value of the temperature gradient at the inner surface may be expressed in terms of the Fourier number, N_{Fo}.

$$\frac{t_m-t_i}{s}+2\sqrt{2}\,\lambda_1 B t_1 \text{-----------------}(A\text{-}2)$$

where

$$\lambda_1=\sqrt{\pi/\alpha\tau_c}$$

$$B=\frac{1}{\sqrt{2(\cosh 2\sigma-\cos 2\sigma)}}$$

$$\sigma=\sqrt{\frac{\pi}{N_{Fo}}}$$

and

$$N_{Fo}=\frac{\alpha\tau_c}{s^2}$$

Defining the outside design temperature t_D as a fictitious constant outside temperature which produces the same amount of maximum heat transmission at the inner surface as is produced by the actual varying outside temperature, Equation A-2 becomes

$$\frac{t_D-t_i}{s}=\frac{t_m-t_i}{s}+2\sqrt{2}\,\lambda B t_1$$

or

$$t_D=t_m+2\sqrt{2}\,\lambda s B t_1$$

or

$$t_D=t_m+2\sqrt{2}\,\sigma B t_1$$

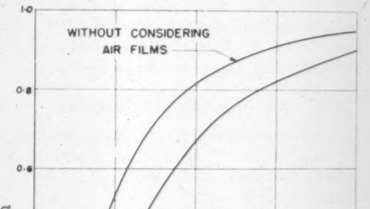


Fig. A-1—Comparison of variation of the dimensionless quantity Ω with the Fourier number, N_{Fo}, for barriers with air films and $(s/k) = 2$, and barriers without air films

This may also be expressed in the form

$$t_D = t_m + \Omega\ t_1 \ldots\ldots\ldots\ldots\ldots\ldots (A\text{-}3)$$

where

$$\Omega=2\sqrt{2}\,\sigma B = \sqrt{\frac{4\pi}{N_{Fo}}}\Bigg/\sqrt{\cosh\sqrt{\frac{4\pi}{N_{Fo}}}-\cos\sqrt{\frac{4\pi}{N_{Fo}}}}$$

Equation A-3 clearly indicates that the outside design temperature should be selected by considering the outside temperature variation represented by t_{max} and t_m as well as the factor Ω, which depends on the building characteristics. Expressing cosh and cos terms as infinite series, and simplifying, Ω may be expressed as

$$\Omega=\frac{1}{\left[1+2\frac{(2\sigma)^4}{6!}+\cdots\cdots\right]^{\frac{1}{2}}}$$

Since $(2\sigma)^4/6!$ is generally less than 1, powers of 2σ higher than the fourth may be neglected.

Therefore,

$$\Omega=\frac{1}{1+\frac{(2\sigma)^4}{6!}}$$

Expressing σ in terms of the Fourier number,

$$\Omega = 1/[1 + (0.22/N_{Fo}^2)] \ldots\ldots\ldots (A\text{-}4)$$

Thus Ω is a function of the well-known Fourier number. Fig. A-1 gives a plot of Ω *vs.* N_{Fo} (with and without considering the air films). The curves rise rapidly for the lower values of N_{Fo} and rise slowly for the higher values of N_{Fo}.

APPENDIX B

Derivation of Equation for Outside Design Temperature Considering Air Films

Analytical equations for periodic heat-flow through homogeneous walls considering the outside as well as inside air-film coefficients have been obtained by Alford, Ryan and Urban,[1] and have been further checked by Mackey and Wright.[2,3] Applying their equations, and assuming the generally acceptable values of the inside and outside film coefficients of 1.65 and 4.0 Btu per (hr) (sq ft) (F deg) respectively, the following equation for the maximum heat load may be derived,

Maximum heat load

$$= \frac{t_m - t_i}{\frac{1}{1.65} + \frac{s}{k} + \frac{1}{4.0}} + 1.65 t_1 \lambda \quad \cdots\text{(B-1)}$$

where

$$\lambda = \frac{5.65 k \lambda_1}{\sqrt{f^2 + g^2}}$$

$f = 5.65k\, \lambda_1\, (\cos \lambda_1 s \cosh \lambda_1 s + \sin \lambda_1 s \sinh \lambda_1 s) + 6.6 \sin \lambda_1 s \cosh \lambda_1 s + 2k^2 \lambda_1^2 \cos \lambda_1 s \sinh \lambda_1 s$

$g = 5.65k\, \lambda_1\, (\cos \lambda_1 s \cosh \lambda_1 s - \sin \lambda_1 s \sinh \lambda_1 s) + 6.6 (\cos \lambda_1 s \sinh \lambda_1 s - 2k^2 \lambda_1^2 \sin \lambda_1 s \cosh \lambda_1 s)$

$$\lambda = \sqrt{\frac{\pi}{\alpha \tau_c}}$$

According to the definition of the design temperature given in Appendix A,

Maximum heat transfer $= [\, t_D - t_1 \,]/[(1/1.65) + (s/k) + (1/4.0)]$

therefore,

$$t_D = t_m + 1.65\ [(1/1.65) + (s/k) + (1/4.0)]\ \lambda\ t_1$$

or

$$t_D = t_m + \Omega\, t_1$$

where

$$\Omega = 1.65\ [(1/1.65) + (s/k) + (1/4.0)]\ \lambda \ \ldots\ldots\ldots\text{(B-2)}$$

These equations may be used for determination of exact values. However, the unwieldy nature of Ω indicates the necessity of a simpler equation. To obtain a simple equation, the following procedure was adopted.

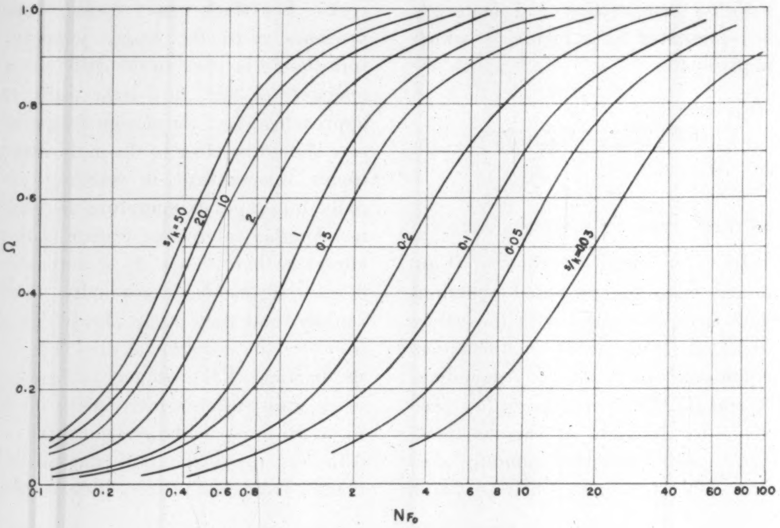


Fig. B-1—Ω *vs.* N_{Fo} for barriers with air films

The present problem remained a problem of pure conduction so long as the air films were not considered. Due to the introduction of air films it becomes one of conduction with convection involving both the Fourier and the Nusselt numbers. Therefore, let Ω be represented by

$$\Omega = \phi\ (N_{Fo},\ N_{Nu}) = \phi\ \{[a\tau_c/s^2],\ [h_i\ (s/k)],\ [h_o\ (s/k)]\}$$

where $[h_i(s/k)]$ and $[h_o(s/k)]$ are the Nusselt numbers corresponding to the inside and outside air film coefficients, and $a\tau_c/s^2$ is the Fourier number. The thickness of the wall, *s*, is taken as the characteristic length in the Nusselt numbers.

If the constant values of the inside and outside film coefficients are substituted, Ω may be represented simply by,

$$\Omega = \phi\ [(a\tau_c/s^2),\ (s/k)]$$

s/k must have such functional relationship that Ω should be unity for $s/k = 0$, and zero for $s/k = \infty$. This is indicated by the equation $t_D = t_m + \Omega\, t_1$.

For walls of negligible thickness $[(s/k)$ approaching $0]$, t_D should evidently be t_{max} or $t_m + t_1$, that is, Ω should be unity. Similarly for walls of infinitely large thickness $[(s/k)$ approaching $\infty]$, t_D should evidently be equal to t_m, or Ω should be zero.

In order to see how the presence of air films affects the relationship between Ω and N_{Fo}, the exact relation between Ω and N_{Fo} for walls of $s/k = 2$ was determined and plotted for walls with as well as without air films. The curves were of similar shape for both conditions. The method of analysis which follows was then tried.

A number of sections of the surface

$$\Omega = \phi\ [(a\tau_c/s^2),\ (s/k)]$$

by the planes s/k = constant were obtained as shown in Fig. B-1. All of these indicated similarity with the plot of Ω *vs.* N_{Fo} without considering the air films, shown in Fig. A-1. Thus Ω could be of the form

$$\Omega = \frac{1}{1 + \frac{0.22}{N_{Fo}^2} + \left(\frac{s}{k}\right)} \quad \text{------------ (B-3)}$$

Another form of Ω satisfying the end-conditions is given by

$$\Omega = \left[\frac{1}{1 + \frac{0.22}{N_{Fo}^2}}\right]\left[\frac{1}{1 + f\left(\frac{s}{k}\right)}\right]$$

This was however rejected as being too complicated.

To arrive at the nature of $f\ (s/k)$, Equation B-3 was written as

$$\frac{1 - \Omega}{\Omega} = \frac{0.22}{N_{Fo}^2}\, f\left(\frac{s}{k}\right)$$

$$\text{or} \quad \log \frac{1 - \Omega}{\Omega} = \log 0.22 f\left(\frac{s}{k}\right) - 2 \log N_{Fo}$$

Fig. B-2 shows $(1 - \Omega)/\Omega$ *vs.* N_{Fo}. The points shown in Fig. B-2 are the points, selected somewhat at random, for which values were calculated. These points did not lie exactly on straight lines $(1 - \Omega)/\Omega$ *vs.* N_{Fo}, having slope of 2 as assumed in the above equation. However, lines having slope of 2 could be fitted with a fair degree of accuracy. These lines of slope 2 were used to determine $f\ (s/k)$ in terms of (s/k). Values of $f\ (s/k)$, thus obtained, were plotted against (s/k) in Fig. B-3. In the lower region, for $0.03 < s/k < 0.2$, the plot of $f\ (s/k)$ could be approximated to a straight line from which the following relationship was obtained:

$$f\left(\frac{s}{k}\right) = \frac{1.83}{\left(\frac{s}{k}\right)^2} \quad \text{for } 0.03 < \frac{s}{k} < 0.2 \ \cdots\text{(B-4)}$$

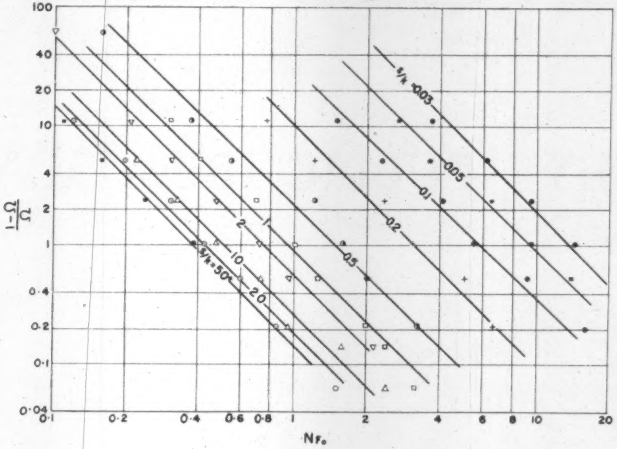


Fig. B-2—$[(1 - \Omega)/\Omega]$ *vs.* N_{Fo} for barriers with air films

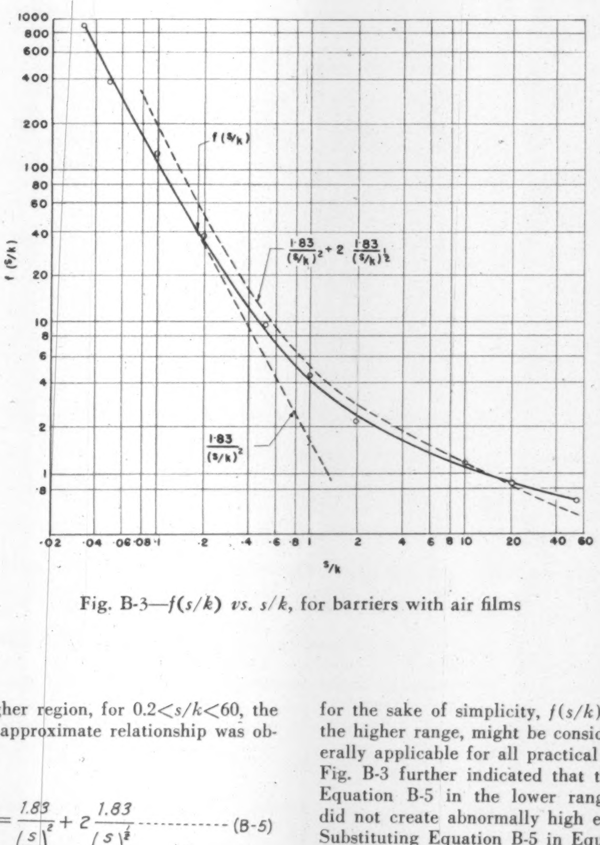


Fig. B-3—$f(s/k)$ *vs.* s/k, for barriers with air films

In the higher region, for $0.2 < s/k < 60$, the following approximate relationship was obtained:

$$f\left(\frac{s}{k}\right) = \frac{1.83}{\left(\frac{s}{k}\right)^2} + 2\,\frac{1.83}{\left(\frac{s}{k}\right)^{\frac{1}{2}}} \text{------------} \quad (B\text{-}5)$$

In arriving at Equations B-4 and B-5, fractional powers of s/k, with the exception of square-root, were avoided since these were likely to make the equation difficult.

The range $0.2 < s/k < 60$ covers most of the commonly used building constructions. It was therefore considered desirable that, for the sake of simplicity, $f(s/k)$, valid in the higher range, might be considered generally applicable for all practical purposes. Fig. B-3 further indicated that the use of Equation B-5 in the lower range of s/k did not create abnormally high errors. Substituting Equation B-5 in Equation B-3 the equation for Ω becomes

$$\Omega = \frac{1}{1 + \frac{0.22}{N_{F_o}^2}\left[\frac{1.83}{\left(\frac{s}{k}\right)^2} + 2\,\frac{1.83}{\left(\frac{s}{k}\right)^{\frac{1}{2}}}\right]} \text{----} \quad (B\text{-}6)$$

Substituting for N_{Fo}, and simplifying, Equation B-6 becomes

$$\Omega = \frac{1}{1 + 0.0007\rho^2 c^2 s^2\left[1 + 2\left(\frac{s}{k}\right)\sqrt{\frac{s}{k}}\right]} \text{----------------} \quad (B\text{-}7)$$

Thus, the equation for estimating t_D is

$t_D = t_m + \Omega t_1$

where

$\Omega = 1/(1 + F)$

$F = 0.0007X^2(1 + 2Y\sqrt{Y})$

$X = \rho c s$

$Y = (1/k)s$

Since $t_D = t_m + [1/(1 + F)]\, t_1$

$F = (t_m - t_D + t_1)/(t_D - t_m)$

Since $(t_m + t_1) = t_{max}$

this equation may be written

$(t_{max} - t_D)/(t_D - t_m) = F$ .....(B-8)

which is another expression for obtaining t_D.

References

1. Effect of Heat Storage and Variation in Outdoor Temperature and Solar Intensity on Heat Transfer through Walls, by J. S. Alford, J. E. Ryan and F. O. Urban (ASHVE TRANSACTIONS, Vol. 45, 1939, pp. 369-96).

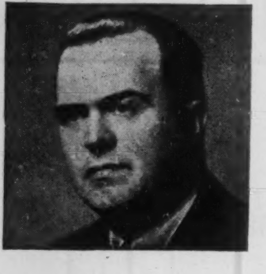
2. Summer Comfort Factors as Influenced by the Thermal Properties of Building Materials, by C. O. Mackey and L. T. Wright, Jr. (ASHVE TRANSACTIONS, Vol. 49, 1943, pp. 148-74).

3. ASHVE RESEARCH REPORT No. 1255—Periodic Heat Flow — Homogeneous Walls or Roofs, by C. O. Mackey and L. T. Wright, Jr. (ASHVE TRANSACTIONS, Vol. 50, 1944, pp. 293-312).

MAVES APPOINTED PACIFIC REGIONAL MANAGER

George Maves, manager of the Boston sales office of Minneapolis-Honeywell Regulator Co. since 1948, has been promoted to the position of manager of the firm's Pacific Region, with headquarters in Los Angeles. He succeeds G. S. Younkin, who recently was named general sales manager for the company.

A member of ASHVE, and a veteran of 20 years' service with Honeywell, Mr. Maves joined the firm in Minneapolis after attending the University of Minnesota. Before becoming branch manager at Boston, he served as regional manager at Denver.



ASHVE PUBLIC RELATIONS

DEAR MEMBERS:

What do our friends, neighbors, and customers think of us, and why do they feel the way they do? We probably are not too sure of the answer to this question, and we may be happier because we do not know the real answer. However, we are certain that it is to our advantage to have them regard us favorably, and we know that their feelings toward us are created largely by our own public relations activities.

Every individual and every organization continually engages in public relations, intentionally or unintentionally, for good or for bad. We are in an age of public relations. No matter to what business, trade, or professional group we belong, the subject of public relations inevitably comes into our discussion, and we find ourselves talking about ways of improving our public relations.

It is not something that we can turn on and off at will. If the program is unorganized, it may be bad or it may be good by accident. The greatest benefit from a public relations program will most likely be obtained only through proper direction and planning.

Many of our well-known technical societies have carefully planned public relations programs that are quite effective. **An organization such as ASHVE has as great an obligation and responsibility to carry on an active public relations program as it has to carry on many of its other activities.**

What is meant by public relations? There are many good definitions offered, but none of them are concise, probably for the reason that public relations is a very involved and complex function. The purpose of public relations is not self-glorification. It consists of more than having someone gifted with the ability to write or speak trying to convince everyone that we are nice people. Through public relations we draw attention to ourselves, and it is very important, therefore, that we have some real accomplishments to publicize, otherwise we may do ourselves more harm than good.

As far as ASHVE is concerned, good public relations requires that we have a record of substantial achievements and make valuable contributions toward the advancement of the arts and sciences of heating, ventilating, cooling and air conditioning for the benefit of the public and in telling everyone concerned about them and emphasizing their benefits to mankind.

It is apparent, therefore, that it involves practically all of our activities. It requires a sound and useful research program. It involves an effort to gather engineering data pertinent to our field of interest and getting it before the profession and the industry in useful form so it will be used for public benefit. It involves education and taking advantage of opportunities to increase the prestige of our profession and tell others about its importance to the economy and to society. It requires that we create a better understanding on the part of our members of our aims, purposes, and activities so they will be more sympathetic toward our efforts.

Our public relations activities must be directed toward all of the members of our profession, including those who are members of the Society and those who are not. We must also think about the allied professions, such as architecture and medicine. Manufacturers, contractors, builders, and educators must be made conscious of our activities.

We must always keep in mind, of course, the public, which is our only customer for our services and products. The most important product we have to sell is the human environment best suited for public health, comfort, and well-being.

Let us find out what is the most ideal environment for different circumstances and conditions and how we can best produce it. Let us tell our customer what we have found and what it will do for him so he will not only want it but will demand it. If we can accomplish this objective, the results are obvious. This sounds like an oversimplification of a very complex problem, but it is a basic approach.

The Officers, Council, and Staff of ASHVE feel keenly the need for a carefully planned public relations program, and in this we have been encouraged and urged by many of our members, including former officers of the Society. The planning is under way, and we have recently added a new staff member to direct our Public Relations work.

Our public relations activities will not be limited to our headquarters office. With some help and guidance, each of our Chapters can do a much more effective job of public relations for us locally than has been done in the past. **Each member of our Society can help because in one way or another he influences public attitude towards our profession through his daily contacts with the public and those who serve the public.**

This is a job that involves all of us, so let each do his share.

Cordially yours for better public relations,

L. N. Hunter

PRESIDENT

JOURNAL SECTION

A Partial Chemical Analysis of Atmospheric Dirt Collected for Study of Soiling Properties[△]

By C. E. Moore*, Chicago, Ill., Robert McCarthy, and R. F. Logsdon†, Louisville, Ky.**

SUMMARY — A number of atmospheric dirt samples have been collected over American cities and analyzed for free carbon, silica, and mixed oxides. The results of the analyses indicate that there is a wide variation in the composition of the dirt occurring over the various American metropolitan areas. The data also show local variations which appear to be related to such factors as terrain and the economic level of the neighborhood. Details of the sampling procedure are discussed.

THE CHEMICAL ANALYSIS of atmospheric dirt is a complex problem. The complexity arises not only from the diversity of elements and compounds present in the dust from each local section of the earth's crust and in various local artificial dusts produced by man, but also from the variety of physical forms these materials may take. In some cases the state of aggregation is more important than the concentration of the elements or compounds themselves.

A study of this nature is of interest to two major groups, the workers in industrial hygiene and the workers in the air cleaning and ventilating industries. Industrial hygienists are interested in the materials which would affect the health of the people and in the identifying characteristics, such as crystalline form, which would determine the source of the dust. Their interest is further focused on the smaller particle sizes, 10 microns and less, which they believe to be the most important from a health standpoint. The air cleaning and ventilating industries are concerned with an additional phase of the problem of air pollution — the control of soiling. This problem has led to the development of extensive testing technology for its evaluation. However, until recently no reliable method had been reported for determination of the greatest soiling material in atmospheric dust, namely, free carbon[1].

Free carbon is defined as uncombined carbon in any of its various forms, and the term *ash*, as used in this paper, refers to the product left after a sample has been burned in the laboratory under controlled conditions. This latter term should not be confused with fly ash.

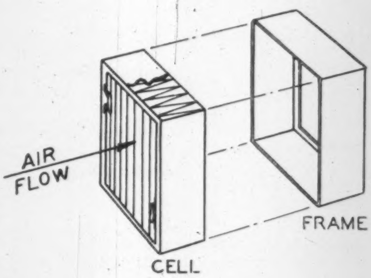


Fig. 1—Air filter cell showing filter element and frame

In order to prepare standard dusts to test air cleaning equipment under conditions similar to those of actual field operations, it is necessary to know not only the concentration of the dust and its chemical composition but also the percentage of material having high soiling property. To obtain useful information for preparing these standards, samples were collected over a number of selected North American cities and analyzed for free carbon, ash, silica, and mixed oxides.

Sampling

A careful consideration of the sampling problems indicated that large installations of dry type filters provided a readily available source of samples. The same type of filter was used in all tests. In this type the dust is arrested on a cellulose tissue medium consisting of six plies of tissue folded into a special frame, Fig. 1. Each frame has cross-sectional dimensions of 24 × 24 in. and together with its cellulose filling constitutes a cell. Each cell is an air filtering unit. The large industrial installation of the type used for the sampling is composed of a number of these cells placed on a single layer across the intake air duct (Fig. 2). The cellulose medium (Fig. 3) is a soft porous paper treated with a high-grade white petroleum oil and so folded that each 24 × 24 in. cell exposes 29 sq ft of dust collecting surface. The face velocity of the air stream is 250 fpm and the velocity

---

[1] Determination of Free Carbon in Atmospheric Dust, by Robert McCarthy and C. E. Moore (*Analytical Chemistry*, February 1952, p. 411.)

[△] Submitted by Robert McCarthy in partial fulfillment of the requirements for his M.S. in the Graduate School, University of Louisville.

*Assistant Professor, Department of Chemistry, Loyola University.

**Research Engineer, American Air Filter Co.

†Assistant Director of Research, American Air Filter Co.

JOURNAL SECTION

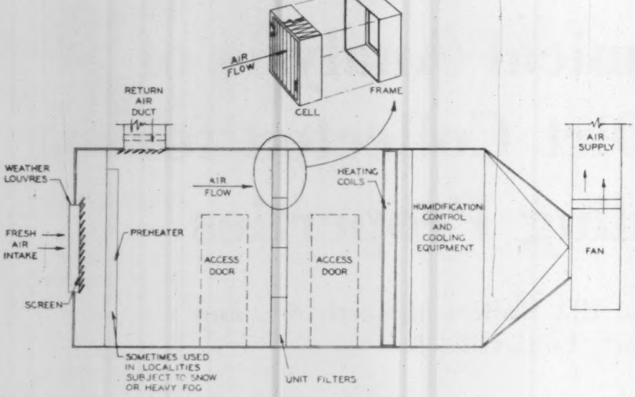


Fig. 2—Typical ventilating system with dry-type air filter units

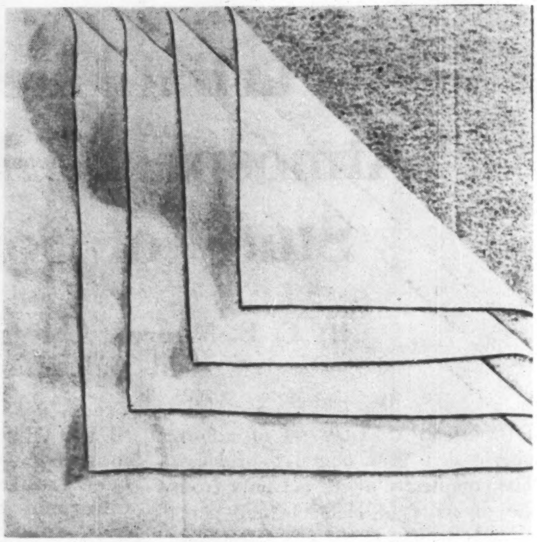


Fig. 3—Photograph of filtering medium showing layer or ply construction

Table 1—Summary of Results of Dust Analyses

Location of Installation	Remarks	% by Weight From Analyses			
		Free Carbon	Ash	Silica	Mixed Oxides
Toledo, Ohio	Intake 2nd floor	36.52	36.23		
Toledo, Ohio	Company manufactures cotton fabrics — intake second floor	35.89	43.85		
Cleveland, Ohio	Sample taken at 9th floor — roof	26.79	64.25	18.65	31.65
Cleveland, Ohio	Downtown area	17.49	64.56	26.04	20.40
Dayton, Ohio	From original installation, building just opened in April	12.87	60.77	21.30	9.98
Kalamazoo, Mich.	Sample taken over 144 hr period, fans on, intake on ground level	14.52	69.22	34.08	30.33
Battle Creek, Mich.	Intake located on fourth floor	35.45	68.42	21.28	18.52
Detroit, Mich.	Very satisfactory filtering results. Intakes 75-80 ft above street	36.13	62.30	30.51	19.70
Detroit, Mich.	Filter in use 12 hr per day — Sat. & Sun. excluded	32.30	44.24	31.35	9.87
Milwaukee, Wis.	Semi-industrial area. Inlet over railroad yard, 5th floor level	20.04	65.52	30.40	19.70
Mishawaka, Ind.	Intake on 4th floor	30.57	52.98	22.98	16.29
Elkhart, Ind.	Intake on floor of warehouse. Much floor dust	11.67	48.16	21.84	15.07
Chicago, Ill.	Industrial Area. Intake on roof of 2nd floor	27.05	52.51	21.46	21.26
Chicago, Ill.	Near railroad switch yard. Intake on roof of 4th floor. Not a clean area, but fairly typical of industrial Chicago	42.27	47.29	21.78	18.42
Niagara Falls, New York	Ground floor intake near open area	28.39	51.33	24.38	18.70
Buffalo, N. Y.	System runs 24 hr per day, 5th floor level	40.90	35.56	21.39	11.41
New York City	Second floor intake	38.26	49.23	22.33	21.28
Baltimore, Md.	Shopping district. Intake 18 ft above street level	27.95	62.73	32.50	16.73
Little Falls, N. J.	Open country — 24 hr per day operation	23.13	62.53	36.98	19.38
Philadelphia, Pa.	Fresh air intake at 5th floor level	32.78	58.84	27.63	18.35
Philadelphia, Pa.	Intake above 2nd floor	31.48	50.40	23.96	13.42
Indian Orchard, Mass.	600 hours continuous service. Intake 30-40 ft above ground	55.82	9.43	5.85	3.23
Springfield, Mass.	Intake at floor level adjacent to parking lot	43.25	55.51	32.93	11.88
Newton, Mass.	Intake on 2nd floor near smokestack and incinerator exhaust	21.71	64.10	32.53	22.67
Boston, Mass.	Intake on 3rd floor near center of Boston business district	46.47	45.45	16.74	7.81
Hartford, Conn.	Center of town. Fresh air taken in at the 10th floor	7.7	74.6	40.4	15.8
Pittsburgh, Pa.	Near industrial and business section. Intake 40 ft above street	36.03	45.08	20.07	18.81
Pittsburgh, Pa.	Poor residential area. Intake 40 ft above street	46.65	34.79	15.23	12.1
Pittsburgh, Pa.	Good residential area. Air intake on roof 50 ft above street	33.96	50.75	24.60	12.73
St. Louis, Mo.	Intake 2 ft above sidewalk	23.15	65.53	33.22	20.58
Knoxville, Tenn.	Filters located on 3rd floor of building in downtown section	38.9	48.7	23.9	20.4
Chattanooga, Tenn.	Weather mild. Intake 6 floors up	32.4	47.1	27.6	15.6
Atlanta, Ga.	100% fresh air for 4 weeks; 75% recirculated for 1 week	27.6	51.6	32.2	16.8
Atlanta, Ga.	————	26.2	58.4	32.9	18.7
New Orleans, La.	————	12.97	59.10	20.48	10.91
Tulsa, Okla.	Sample taken over 6 weeks' period	7.96	66.75	42.32	9.36
San Francisco, Calif.	Air intake at 18th floor	24.54	46.79	26.54	18.53

through the filtering medium is 35 fpm. (This arrangement has a collecting efficiency of about 95 percent by the ASHVE Standard Code for Testing and Rating Air Cleaning Devices Used in General Ventilation Work (1934), and 91 percent by the *Air Filter Institute*, Code for Testing Air Cleaning Devices Used in General Ventilation: Section I, Unit or Panel Type Air Filtering Devices (1953).

Sales representatives in the selected cities took samples from these installations in the months of April and May, 1949. Care was exercised to take the samples under as similar conditions as operations of the units would permit. Outstanding terrain factors in location of the unit, floor level of the fresh air intake, nearness of incinerators and exhaust stacks, and other significant factors were recorded. The samples were packed in plastic bags and mailed to the laboratory.

Analysis of Atmospheric Dirt Samples

Each loading of filter medium containing the collected dirt was shaken over a piece of glazed wrapping paper, and the oil-soaked dirt which fell off was retained for analysis. The sample was extracted with several small portions of ether to remove the oil, was oven-dried, and was then put through a 60-mesh screen to remove any particles of paper that may have come from the collecting medium. Each sample was dried for one hour at 100 C before weighing.

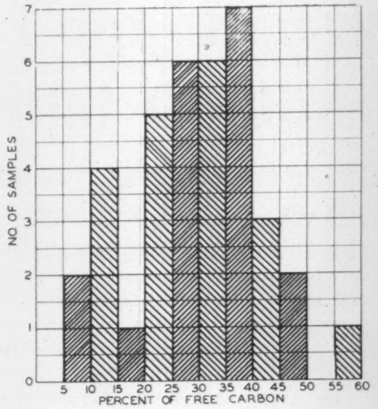


Fig. 4—Percent of free carbon in samples

Free carbon was determined by the method proposed by McCarthy and Moore[1]. Ash was determined by weighing a separate sample because the use of porcelain filter crucibles renders impossible any further analytical treatment of the ash from the carbon determination. R_2O_3 and SiO_2 were determined by standard analytical methods[2,3]. These results are summarized in Table 1.

Discussion of Results

The samples when freed of oil had a wide variation in color from jet black to a light tan. In general the blacker samples showed the higher free carbon contents, although close distinctions could not be made on the basis of color. The material collected was composed of linty matter, free carbon, and mineral matter. The percent mineral matter is accounted for by the percent ash; the linty matter is the difference between 100 percent and percentages of free carbon and ash.

The ash was analyzed for its silica (SiO_2) content and for the mixed oxides (R_2O_3). The precipitate of mixed oxides may contain the oxides Al_2O_3, Fe_2O_3, TiO_2, ZrO_2, P_2O_5, V_2O_5, and Cr_2O_3.

The atmospheric dirt collected over North American cities varied widely in composition. The free carbon varied from 55.8 percent in Indian Orchard, Mass. to 7.7 percent in Hartford, Conn. Ash varied from 74.6 percent in Hartford, Conn. to 9.4 percent in Indian Orchard, Mass. Silica varied from 42.3 percent in Tulsa, Okla. to 5.9 percent in Indian Orchard, Mass. The mixed oxides showed a variation of 30.3 percent at Kalamazoo, Mich. to 3.2 percent at Indian Orchard, Mass.

The distribution of samples of various free carbon, ash, silica, and mixed oxide contents are shown in Figs. 4, 5, 6, and 7.

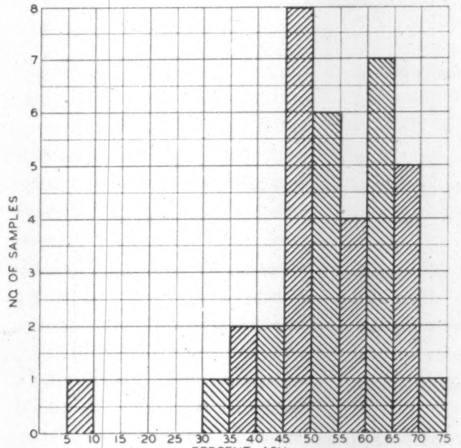


Fig. 5—Percent of ash in samples

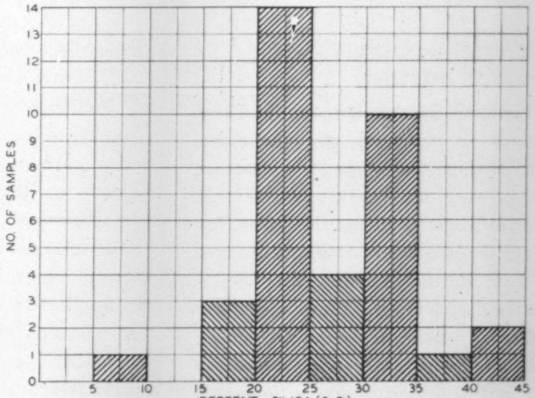


Fig. 6—Percent of silica (SiO_2) in samples

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[2] *Standard Methods of Chemical Analysis*, by W. W. Scott (D. Van Nostrand Co., Inc., New York, 1939; Fifth Edition, pp. 800-801).

[3] *Talbot's Quantitative Chemical Analysis*, by L. F. Hamilton and S. G. Simpson (Macmillan Co., New York, 1947, Ninth Edition, pp. 318-319).

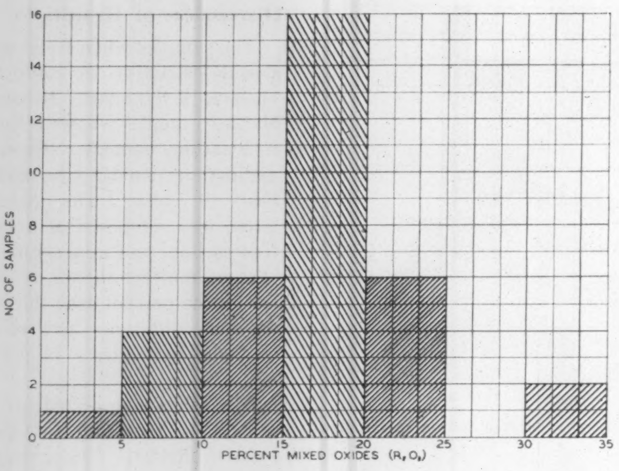

Fig. 7—Percent of mixed oxides in samples

The physical nature and chemical composition of atmospheric dirt at a given location is widely variable because of climatic fluctuations and changes in the local environment. Continuous sampling, therefore, appears to be the only reliable means of collecting samples that are to be used for comparative purposes.

The data in Table 1, which were obtained from samples taken by continuous sampling and thus represent an average of the conditions during the period of sampling, indicate that some useful and interesting comparisons can be made. A contrast of samples taken from units whose intake ducts are above the second floor level with samples taken from units with ducts below this level show that the higher levels have, in general, a higher percentage of free carbon. This fact is a probable consequence of a higher concentration of street dust in the lower levels rather than a decrease in free carbon in the air at the lower levels.

A contrast of the results from good residential, poorer residential, and business areas in Pittsburgh shows that the results from the poorer areas run about 12 percentage points higher in free carbon than in the good residential areas. This increase in free carbon probably results from the use of coal stoves for home heating in the poorer sections. The business section which has more efficient heating plants compares favorably with the good residential area in percent free carbon.

The free carbon content of outside air is of considerable importance and should be considered in the formulation of synthetic dusts and testing methods for evaluating air cleaner performance. It is not the purpose of this paper to establish the amount of free carbon, if any, that should be incorporated in artificial test dusts. These findings, however, should be helpful in providing a basis for an intelligent approach to these problems.

It is recognized that the sampling medium used for these tests permits the passage of some of the submicronic particulate matter, such as smoke and fumes, and for this reason the results may not represent the absolute values for each of the constituents. The authors are carrying out additional investigations using high efficiency electrostatic sampling devices but have so far limited the study to only one location, Louisville, Ky.

PARMELEE ADDRESSES AMS ANNUAL MEETING

Members in attendance at the 131st annual meeting of the *American Meteorological Society* in Columbus, Ohio, were told September 9 that weather reports form the basis for scientific house and building design.

G. V. Parmelee of the ASHVE Research Laboratory, Cleveland, said *hours of sunshine, wind velocities, outdoor temperature and humidities are just as important as wall conductance heating and cooling equipment and building construction in determining the comfort of the occupants.*

Mr. Parmelee's paper, Application of Meteorological Data to Indoor Climate in Buildings, was one of a series presented on the subject, Climate in Relation to Building and City Planning.

He discussed the principles of thermal circuits, and also discussed the application of the sol-air temperature concept which expresses several important weather elements as a single temperature index.

In conclusion, Mr. Parmelee said that it is apparent that factors of mutual interest to the meteorologist, architect and engineer can be investigated by the following thermal circuit principles: (1) significance of various elements of the weather; (2) effect of heat capacity, thermal resistance and solar absorptance of the outer portions of the structure; (3) effect of the heat capacity of the internal portion of the structure; and (4) influence of ventilation of the occupied and unoccupied spaces. Study in this area, he added, needs the full assistance of experimental work.

Analogue Computer Analysis of Residential Cooling Loads

By T. N. Willcox[*], C. T. Oergel[**], S. G. Reque[†], C. M. toeLaer[††], and W. R. Brisken[°], Bloomfield, N. J.

SUMMARY — Field tests in several parts of the country confirmed reports that generally acceptable indoor comfort conditions could be maintained in many homes with less installed cooling equipment capacity than predicted by steady state calculations. This condition is due to the internal heat storage. The investigation shows how to evaluate the heat storage capacity and relates it to the building structure. The analysis was accomplished with the aid of an analogue computer and was substantiated by field test.

PERSISTENT reports from various parts of the country indicated that many homes are being comfortably cooled with smaller equipment than would be required to match the calculated sensible heat gain. Three factors could contribute to this condition:

1. A fundamental error may exist in the heat gain calculation for residences.
2. Users may be satisfied with higher indoor temperatures than the design temperature assumed for the load calculations.
3. Equipment output may be higher than the manufacturer's rating.

The likelihood that cooling equipment output could run consistently higher than published performance ratings is remote because of the substantiation of published ratings by accurate laboratory tests. Consideration was given, however, to the low indoor wet-bulb temperatures which in effect increase the sensible capacity of the equipment. This investigation was limited to performance preferences of users and to residence cooling loads.

User Preference

During the summer of 1953 extensive comfort surveys in 17 homes were completed to substantiate a six-year field investigation. Pertinent data concerning these homes are given in Table 1. Each survey included a personal interview, temperature measurements in the home, a complete construction detail for a room by room heat gain calculation, numerous trips to the various homes, and an end of season follow-up questionnaire.

Selection of the test homes was made on the basis of climate, the type of house, and the amount of undersizing of cooling equipment based on existing methods of load calculation. Single family, owner-occupied houses were selected. Floor area ranged from 1400 to 3600 sq ft. Brick veneer, frame, and masonry houses were included. Some had wall insulation and all had ceiling insulation.

Dallas, Texas and Kansas City, Mo., were chosen as areas having a high outdoor design temperature and a medium daily temperature range. Northern New Jersey (15 miles from New York City) was chosen for a low daily temperature range. Design temperatures in common use are shown in the following tabulation:

	Outdoor Dry-Bulb Temp[1] F	Outdoor Wet-Bulb Temp[1] F	Daily Range Temp[2] F deg
Dallas	100	78	Medium
Kansas City	100	76	Medium
Newark	95	75	Low

[1] Exponent numerals refer to References.

Table 2 gives the results of heat gain calculations on the individual houses, the indoor temperature range which the user desired, and the degree of satisfaction obtained. The most interesting thing regarding these results is the user acceptance of a surprising degree of *undersizing* judged by current standards of heat gain. The lowest satisfactory percentage of installed capacity for a whole house was 62 percent.

Although the temperature ranges of user comfort appear to be widely scattered, the results assume significance when the high and low limits are plotted on probability paper. Fig. 1 shows that 50 percent of these and similar users would accept 81 F as a maximum and 75 F as a minimum comfortable indoor temperature. Also, Fig. 1 shows that for an indoor temperature of 78 F, approximately 90 percent of these and similar users would be satisfied. The rest would be equally divided, 5 percent too hot and 5 percent too cold.

The field test survey makes it clear that the interviewed users prefer an indoor temperature in the range customarily used for heat gain calculations. This same indoor temperature, when substituted into the heat gain calculation, results in the selection of cooling equipment substantially larger than it need be for comfort to these users. Serious doubt is thus cast upon the accuracy of current methods used in calculating residential heat gains.

Obviously the inaccuracy is due to failure to consider the heat storage capacity of the structure and contents.

The existence of these thermal storage effects has been recognized for some time. Various methods based on experience or theory or a combination of the two have been

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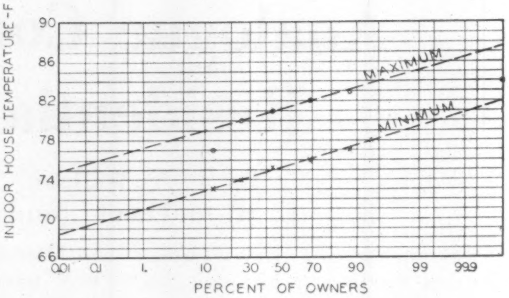
devised for taking them into account. Some ingenious methods make use of time averages of heat gains. These methods all leave something to be desired, and a more realistic solution to the problem would be appreciated. The analogy between heat and electric circuits has therefore been used as a means of solution.

First attempts were to instrument a house and devise a circuit to fit the test results. Mathematical difficulties encountered were of two kinds. If the assumed house circuit was simple enough to be fitted to the test results, its parameters could not be related to house details. The circuit could not then be used to predict performance in a house of different construction. If the circuit was sufficiently complex to represent the house, it could not be fitted to the test data. There were too many constants to be evaluated. Many complex circuits can be constructed to produce the same response. Another difficulty in fitting the circuit to the test results is that, with varying load conditions, there are always twice as many constants as equations to determine them. A second set of equations could be obtained from operation at constant conditions. Operation under constant conditions would determine the thermal resistances and operation under varying conditions would determine the thermal storages. Constant operating conditions are, however, very rare in nature if they exist at all. It means that the weather conditions must be constant and that the equipment capacity must be precisely suited to the load. This attempt at the problem solution was abandoned.

Fig. 1—Maximum and minimum indoor temperature limits acceptable to owners



With the advent of the electrical analogue computer, the problem was attacked again. This time the process was reversed. A circuit was devised based on the physical structure of a house. Mathematical difficulties were overcome by using an analogue computer. The circuit was established for a house which had been tested[3]. Computer results agreed with test results within engineering accuracy. This was accepted as verification of the circuit.

Thermal Circuit

The thermal circuit developed for these calculations is shown in Fig. 2. It comprises five major branches and a thermostat branch, each of which is connected to the bus, the voltage of which corresponds to indoor temperature, which was assumed to be the same throughout the house. One branch shown at the upper left of Fig. 2 consists of the straight resistance loads. Actually the windows, and doors and Venetian blinds have some thermal capacity. They are here neglected because their time constants are small, being of the order of 3 min, while the time constants of the other branches vary from 2.4 hr for frame walls to 9 hr for solid masonry walls. The time constant is taken as the time required for the heat flow to the house air to reach 63.2 percent of its steady state value when the branch is subjected to an instantaneously applied constant outdoor temperature. The infiltration can be taken as a resistance because only sensible heat gains are being considered. For the case of Venetian blinds, the sun load coming through the glass is introduced on the blind. The resistance R_2 then consists of three separate resistances, outside air to glass, glass to air between the window and the blind, and air to blind. The resistance R_3 is from the blind to the indoor air. The resistances through the glass and the Venetian blinds are neglected since they are small compared to the air film resistances. When there are no Venetian blinds, the sun load through the glass is introduced on the floor, then R_2 consists of two film resistances, outside air to glass and glass to inside air, and R_3 is of course zero. The resistance R_4 consists of outside and inside air film resistances.

Table 1—Test House Information

House No.	Location	No. of Stories	Type of Foundation	Wall Construction[a]	Total Sq Ft Floor Area Conditioned	No. of Occupants	Children 15 years or under
1	Dallas	1	Crawl	B.V.I.	1705	2	No
2	Dallas	2	Crawl	Frame	3630	5	Yes
3	Dallas	1	Crawl	B.V.I.	1485	5	Yes
4	Dallas	1	Crawl	B.V.I.	1850	3	No
5	Dallas	1	Crawl	B.V.	1655	4	Yes
6	Kansas City, Mo.	2	Basement	Frame, I	2105	4	Yes
7	Kansas City, Mo.	2	Basement	C.B.I.	2290	4	Yes
8	Kansas City, Mo.	2	Basement	Frame	1690	2	No
9	Kansas City, Mo.	1	Basement	B.V.	1410	2	No
10	Kansas City, Mo.	2	Basement	Frame	1480	4	No
11	New Jersey	1	Basement	Frame, I	1745	4	Yes
12	New Jersey	1-SL[b]	Basement	Frame, I	1945	6	Yes
13	New Jersey	2	Basement	Frame	1780	4	Yes
14	New Jersey	1	Basement	B.V.	1616	4	Yes
15	New Jersey	1-SL	Basement	Frame, I	1500	2	No
16	New Jersey	1-SL	Basement	Frame, I	1930	4	Yes
17	New Jersey	2	Basement	Frame, I	1545	6	Yes

[a] B.V.I. = Brick Veneer, Insulated
C.B I. = Cinder Block, Insulated
[b] S.L. = Split Level

The branch for the walls is a single π branch with the sun load introduced at the outside wall surface. The use of a single composite wall to replace the four separate walls is justified on a theoretical basis. It is to be noted that the differential

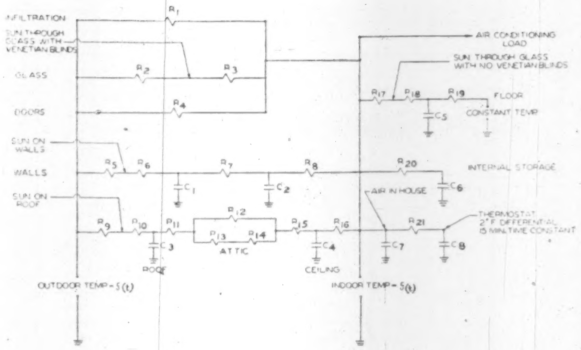


Fig. 2 — Equivalent thermal circuit

equations giving the wall heat flows to the indoor air on a unit area basis, are identical for the four walls except for the solar radiation heat loads. These four equations can be combined to give the composite wall which will give, when subjected to the total solar radiation, for the four separate walls, the correct total heat flow into the house. The equality which holds for heat flow does not hold for the temperatures in the wall. The composite wall is therefore used here only for heat gain calculations. R_5 is the outside air film resistance. R_6 is one half the resistance of the outside wall section, that is that part of the wall which is outside the studding. C_1 is the thermal capacity of the outside wall. R_7 consists of half the resistance of the outside wall section, the resistance of the air space, and one half the resistance of the inside wall section. C_2 is the thermal capacity of the inside wall section. R_8 consists of one half the resistance of the inside wall section and the air film resistance from wall to inside air. The splitting of the wall resistances puts the thermal storage at the average temperature.

The branch for the roof, attic, and ceiling is actually a π circuit with the attic shown in detail. R_9 is the outside air film resistance. The solar radiation load is introduced at the roof surface. R_{10} is one half the roof resistance. C_3 is the roof thermal storage. R_{11} is the second half of the roof resistance. R_{13} is the film resistance from roof to the attic air. R_{14} is the film resistance from attic air to ceiling. The thermal storage of the attic air should be introduced between R_{13} and R_{14}. It is, however, small so that its time constant is only a few minutes. It is therefore neglected. An infiltration heat load should be introduced between R_{13} and R_{14}. It is negligibly small for natural ventilation of one change per hour. R_{12} is to account for radiation from the hot roof to the top of the ceiling. R_{15} is one half of the ceiling resistance. C_4 is the thermal storage of the ceiling. R_{16} is the other half of the ceiling resistance and the film resistance from ceiling to inside air.

At the upper right of Fig. 2 a T circuit represents the floor. R_{17} is the film resistance from inside air to floor surface. For the cases of no Venetian blinds the sun load coming in through the glass was introduced at the floor surface. R_{18} is one half the floor resistance. C_5 is the thermal storage of the floor. R_{19} is the other half of the floor resistance and the film resistance from floor to basement air.

The fifth branch is the internal storage L circuit. It comprises internal partitions, furniture and all thermal storages which have heat exchange only with the air in the house. C_6 is the total thermal storage and R_{20} is the resistance from air to average storage temperature and hence includes the air film resistance.

At the bottom right of Fig. 2 is shown C_7 which is the thermal storage of the air in the house and an L circuit comprising R_{21} and C_8 to represent the thermostat with a 15-min time constant. The thermostat was arranged to control the air conditioning load, shown at upper right, with a 2 deg differential.

The parameters for this analogue circuit are determined from construction details, and they are therefore related to physical entities.

The circuit parameters were determined for the Research Residence No. 2 of the University of Illinois. The required cooling capacity as determined by analogue circuit calculations was only 7 percent higher than that shown by an actual test on the house[3]. The imposed conditions of air and sun for these calculations

Table 2—Test House Results

House No.	Nominal Installed Tons	Installed Capacity Percent of Load[a] Calculated	User Comfort Range[b] High F	User Comfort Range[b] Low F	User Satisfied	Comment
1	3	60	80	76	Yes	Partial cooling demand
2	7½	103	—	—	Yes	
3	3	79	83	75	Yes	
4	5	75	77	73	Yes	
5	3	44	84	75	Yes	Partial cooling demand
6	5	134	84	77	No	Blocked Supply One room
7	3	62	82	76	Yes	Masonry Partitions and floors
8	3	75	81	78	Yes	
9	3	83	83	76	Yes	
10	3	78	83	81	No	Temp. good, Too noisy at night
11	2½	74	—	—	No	Hot room over garage
12	3	75	77	74	No	Hot room over garage
13	2	56	82	77	No	Upstairs too hot
14	2	79	82	74	Yes	
15	2	68	82	77	Yes	Marginal
16	3	64	81	76	No	Hot room over garage
17	3	86	80	75	Yes	

[a] Calculated loads are based on 80 F indoor design temperature and include duct allowances.
[b] Temperatures corrected for error in house thermometer on thermostat..
Users were asked:
How high (and low) can the indoor temperature go and still feel reasonably comfortable?

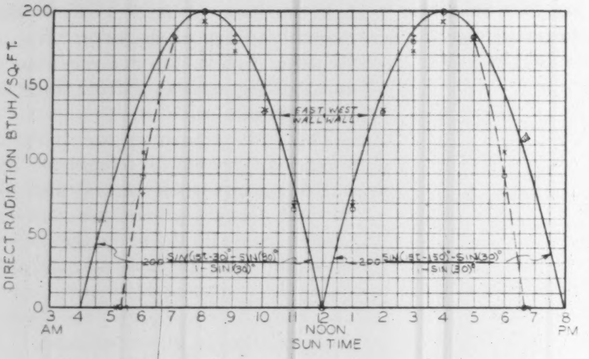


Fig. 3—Solar radiation intensity for east and west wall

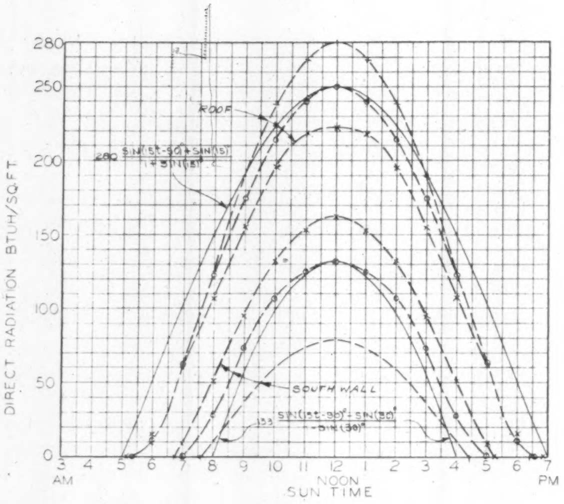


Fig. 4—Solar radiation intensity for south wall and roof

corresponded to those prevailing during the test. This check was accepted as additional evidence that the analogue circuit represents the house with good engineering accuracy.

Thermal Loads

Three sources of heat were considered; that from the outdoor air, that from solar radiation, and that due to temperature difference between house and basement air temperatures. No consideration was given to heat from occupants or such indoor loads as appliances, lights, etc. Only the sensible components of the heat gains were considered. Dehumidification loads were circumvented by assuming each ton of refrigeration to consist of 8600 Btuh sensible and 3400 Btuh latent heat. This average is in accord with experience.

Outdoor air temperature was taken as a sine curve with the maximum at 2:00 p.m. sun time, and it was assumed to repeat itself day after day. Three sine curves were used as representing different climates. One varied from 85 F to 100 F which could represent Tampa, Fla., with 28 deg latitude. One varied from 75 F to 100 F which could represent Cincinnati, Ohio, with 40 deg latitude. One varied from 55 F to 100 F which could represent Spokane, Wash., with 48 deg latitude.

The sun loads which were taken for a clear sky on August 21 consisted of direct and diffuse radiation on walls and windows and direct radiation on the roof. Fig. 3 shows direct radiation intensity on the east and west walls and Fig. 4 shows direct radiation intensity on the roof and south wall. Dashed curves are drawn through the calculated intensities. The solid curves are portions of sine waves and show the intensities actually used in the calculations. Latitude has a negligible effect on east and west wall intensities. Latitude does affect roof and south wall intensities but these two loads have a small effect on the house. The south wall load is small and the large roof load fails to penetrate the attic and the ceiling insulation. If the solid curves were not considered sufficiently accurate it would therefore be relatively easy to correct for latitude. Diffuse radiation intensity was taken proportional to roof radiation intensity with a peak intensity of 25 Btuh per sq ft. The sun loads are the product of the intensity, the incident area, and a coefficient. The radiation transmission coefficient for glass was taken at 0.9. The absorption coefficients were 0.5 for (white) frame walls, 0.75 for brick veneer and heavy masonry, and 0.9 for the roof.

The basement was taken as an infinite heat reservoir at 80 F. For awnings it was assumed that the solar load through the windows was just half of that which was calculated for no protection. The analogue circuit was modified for the case of Venetian blinds which were assumed drawn and closed on all windows.

The thermostat was arranged to have a 15-min time constant and a 2 deg differential. Three thermostat settings were used: 70 to 72, 74 to 76, and 78 to 80 F.

Air infiltration was taken at one air change per hour in all cases.

Cooling Loads by Analogue Computer Methods

It has been recognized for a long time that a complete duality exists between resistance-capacity electrical networks and thermal circuits. If it is assumed that voltage corresponds to temperature and electrical charge corresponds to quantity of heat, a consistent equivalence results. Current, which is rate of change of charge, then corresponds to rate of flow of heat, electrical resistance corresponds to thermal resistance, and electrical capacitance corresponds to thermal capacity. It is impracticable to construct equivalent electrical networks for thermal circuits which show very slow behavior with time. However, it is easy to construct electrical networks which differ only in the ratio of their time responses. The technique of solution using this approach is very direct. An electrical network is constructed on a suitable time scale. Electrical signals of the same form as the independent heat sources are applied to the proper terminals of the network and the response of the network is recorded,

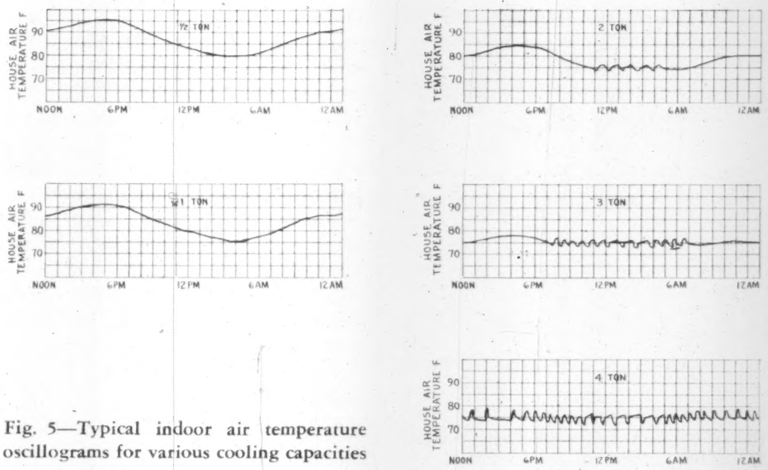


Fig. 5—Typical indoor air temperature oscillograms for various cooling capacities

by oscillograph, at the points under consideration. The practical limitations of this method of study appear to lie in the techniques of signal generation and recording. This method has many practical advantages. It was not used in these studies, however, because an analogue computer was available with which to obtain the desired solutions within the degree of accuracy desired.

For the purpose of this study, an analogue computer may be considered as an assembly of amplifiers which have two significant properties. The first property of interest is that the amplifiers can be made to respond dynamically in a fashion analogous to a circuit element or simple combination of circuit elements. The other property of interest is that the amplifiers can be excited from any number of separate sources. The technique used to set up the problem follows from these two properties. See Appendix A.

If any junction of the thermal circuit is considered in detail, the differential equation of heat balance at that junction will involve a simple time varying factor and the temperatures of adjacent junctions. For example, the temperature at junction 2, T_2, might be calculated from the heat balance equation as a function of T_1 and T_3 (the temperatures at junctions 1 and 3) and t_2, a time constant. An amplifier in the computer can then be set up with the proper time behavior and gains for the corresponding temperatures.

If the foregoing process is carried out for each of the network junctions, the remaining steps in setting up the thermal circuit are simple. The output of amplifier 2, calculating T_2, is connected to all other amplifiers requiring T_2 as inputs, etc. The resulting interconnection of amplifiers automatically satisfies all of the conditions existing in the original thermal circuit. The solutions for the transient temperatures are now obtained by applying suitable signals to the independent inputs of the thermal circuit. At this point the procedure of signal generation and recording are similar to those which apply to the previously described method of using a static electrical network.

Several advantages are obtained by using the analogue computer to simulate the thermal circuit. The outputs of the computing amplifiers used to solve for the junction temperatures are negligibly affected by external loading. As a result, the individual temperatures may be read with ordinary meters or oscillographic equipment without disturbing the temperature distribution in the circuit. In addition, the inputs to these amplifiers are usually of very high impedance so that the signal generation equipment need not have significant power capability.

There are two principal disadvantages in the use of an analogue computer, one real and one only apparent. The cost of using analogue equipment for simulating thermal circuits may appear to be extremely high. In terms of total cost it is undoubtedly the most economical, because setup time and running time are held at a minimum. Relatively few comprehensive studies are required to justify an investment of this type. The real disadvantage in using an analogue computer technique of the type described lies in the manner in which errors can accumulate unless extreme care is used in setting gain coefficients. It was found necessary to set individual amplifiers within a few tenths of 1 percent in order to

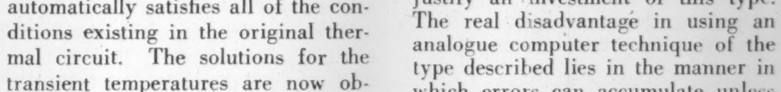


Fig. 6—Typical heat flow oscillograms for thermal circuit branches with 3 tons of cooling

JOURNAL SECTION

Table 3—Unit Heat Gain for 22 F deg Temperature Difference Btuh per Sq Ft

Case	Wall	Ceiling	Floor	West Window Solar	Windows		Conduction & Diffuse Radiation
					Conduction	Diffuse Radiation	
6B	5.48	1.46	0.73	93.0	11.14	16.96	28.1
7B	6.48	1.35	0.34	96.5	11.14	16.96	28.1
8B	6.17	1.39	0.62	101.3	11.14	16.96	28.1
8M	6.33	1.60	0	94.2	11.14	16.96	28.1
8O	6.03	0.79	0.83	86.0	11.14	16.96	28.1
8P	6.07	1.57	0.29	106.6	11.14	16.96	28.1
8R	6.01	1.34	0.48	107.7	11.14	16.96	28.1
9B	6.92	1.82	0.78	101.4	11.93	17.27	29.2
9N	6.26	—	0	98.3	11.93	17.27	29.2
By Computer, Avg.	6.19	1.42	0.45	98.3	11.32	17.03	28.4
Steady State	6.9	4.0	0	75.	—	—	28.

Note: All heat gains based on fully shaded windows.

obtain accuracies in overall results of the order of 3 percent. For engineering purposes this order of accuracy is sufficient and can be obtained with most of the analogue computers which are currently available commercially.

A typical set of oscillograms are shown in Figs. 5 and 6. These oscillograms were recorded on standard Brush recording equipment. In this particular study the time scale was arranged so that one second of machine time corresponded to one hour of problem time. One minute of recording therefore gave a 60 hr history on the house.

Calculations and Results

There were 108 possible different houses having characteristics shown in Appendix B, which could be subjected to nine possible different sets of conditions giving a total of 972 possible different sets of calculations. A sample of about 5 percent of the total possible combinations was chosen to study various effects. The analogue circuits were set up in the computer and subjected to the daily air temperature and solar load cycles. In each case a record was made of the indoor temperature for installed capacities of ½, 1, 2, 3, and 4 tons. Fig. 5 is representative of these results, showing indoor temperatures for various capacities of cooling unit. In each case the daily weather cycle was repeated a sufficient number of times so that initial transients were removed. For some of the cases set up for calculation, the daily cyclical heat flows in the five separate branches of the analogue circuit, were recorded along with the on and off operation of the cooling unit. Fig. 6 is representative of these results.

The computer calculated cyclical results. These were analyzed for (1) effect of installed cooling capacity on indoor air temperature, (2) unit heat gains, and (3) an allowance for internal heat storage.

From the accumulated data it is practicable to establish factors which can be used to estimate the separate heat gains for the various surfaces and for the heat storage allowance. The net heat gain then gives the required capacity. Analysis of the machine calculated results shows that the total net heat gain is a maximum at very nearly 3:00 p.m. sun time for all the cases considered. The separate heat gains were therefore determined at 3:00 p.m. These heat gains were used to evaluate the heat gain per unit area shown in Table 3.

The unit heat gains obtained from the analogue study differ from those being used for steady state calculations. The differences, although small, warrant some changes in steady state unit heat gains if accuracy is to be obtained (discussion of these changes is outside the scope of this paper). The big discrepancy between the required capacity and that computed by the steady state method is due to heat storage.

Heat Storage Allowance for Cooling Load Calculation

The steady state method of calculating heat gains is an attempt to use a static method to analyze a dynamic phenomenon. Perhaps the most serious omission is the internal storage which in effect is a heat sink during the heat of the day. The effectiveness of internal storage as a heat sink depends on the time rate of increase of its temperature. This in turn is related to the time rate of increase of indoor air temperature. These relations were investigated. The basic relationship is that the difference between the house heat gains and the cooling capacity is equal to the sum of the heat being absorbed by the air in the house and the heat being absorbed by internal storage. In symbols:

$$Q_i - Q_o = C_a\ (dT_a/dt) + FC_I(dT_I/dt)$$

where

Q_i = Total heat gains
Q_o = Air conditioning capacity
C_a = Thermal capacity of air in house
T_a = Temperature of air in house
F = A factor to be determined
C_I = Thermal capacity of internal storage
T_I = Temperature of internal storage
t = Time

Now it is necessary to relate the time rate of change of internal storage temperature to that of the air temperature. This can be done theoretically by applying a sinusoidal temperature to the internal storage circuit. Neglecting the transient solution, it is found that

$$dT_I/dt = \beta\ (dT_a/dt)$$

where

$T_a = A \cos \omega t$
A = maximum indoor temperature
$\beta = \sin \theta \cos (\theta + \omega t)/\sin \omega t$
$\theta \doteq \tan^{-1} [R/(\omega C_I)]$
R = thermal conductance between internal storage and house air.
ω = 360 angular degrees/24 hours when time, t, is in hours.

Using this result the heat flow to internal storage can be written

$$FC_I\ \beta\ (dT_a/dt)$$

The value of this heat flow is known from the machine calculations. The value of dT_a/dt can be obtained from the machine calculated indoor temperature and the value of C_I is known. Thus the product $F\beta$ can be calculated and with engineering accuracy it can be taken as unity. Then

$$Q_o = Q_i - (C_I + C_a)\ (dT_a/dt)$$

and this equation can be used to calculate the required cooling capac-

Table 4—Heat Storage Allowances

Room by Room Calculation		Overall Calculation		
No. of Heat Storage Surfaces	Percent Reduction of Conduction Plus Infiltration	House Foundation	No. of Stories	Percent Reduction of Conduction Plus Infiltration
		Crawl	1	5
1	0	Crawl	2	10
2	5	Slab	1	10
3	10	Slab	2	15
4	15	Basement	1	10
5	20	Basement	2	15

Note: Heat storage surfaces have conditioned space on both sides. Slab floors are heat storage surfaces.

ity Q_o, for any acceptable rate of increase of indoor air temperature. Q_1 is of course determined from the heat gain factors. It is noted that C_a is usually small compared to C_1 and may then generally be neglected.

Application of Heat Storage Allowance

Heat storage capacity of interior partitions, floors, and furnishings can be used to reduce the load on air conditioning equipment. Two conditions are necessary:

1. The surface temperature of the heat storage body must be cooler than the room air.
2. Warm room air must be moved to the cooling surfaces.

The first condition requires the indoor temperature to rise above the preset thermostat temperature. If the rise is kept small enough, no perceptible change in comfort will be noticed. The maximum temperature rise to be permitted by the *Heat Storage Allowance* herein described is 2 F deg.

The second condition requires rapid redistribution of heat from any localized sources to all the rooms of the house. Instantaneous loads from sunlight, people, and appliances may quickly saturate the allowable heat storage capacity within the rooms where they occur, after which the air temperature in those rooms becomes uncomfortable. Because of the variety and specialized nature of instantaneous loads, they are best handled by providing a full match of cooling capacity in the air conditioner. Other loads, such as conduction and infiltration are distributed all over the house, just as is the heat storage capacity. These are the loads which can be most easily reduced by heat storage.

The analogue computer study gave the following ratios:

$$\text{For 1 story house}\quad \frac{\text{Heat Storage Rate}}{\text{Conduction \& Infiltration Load}} = 0.13 \text{ or } 13\%$$

$$\text{For 2 story house}\quad \frac{\text{Heat Storage Rate}}{\text{Conduction \& Infiltration Load}} = 0.22 \text{ or } 22\%$$

These ratios define the term *Heat Storage Allowance.*

Practical use of the heat storage allowance is made by subtracting from the conduction plus infiltration load a percentage equal to the heat storage allowance. The allowance is related to the number of heat storage surfaces in a room, there being a maximum of six, counting the four walls, ceiling and floor. A heat storage surface has conditioned air on both sides. Concrete slab floors are, also, considered to be heat storage surfaces, since they have such a large thermal storage mass away from the exposed perimeter.

Table 4 gives the percentage heat storage allowances by which conduction and infiltration loads are reduced when making a room-by-room heat gain calculation on a residence. The same tabulation gives heat storage allowances for an overall load calculation, classifying residences by number of stories and type of foundation. A comparison of the heat storage rates calculated by these two methods is included in a portion of Table 5. This table also shows for comparison the amount of heat that could be stored in the interior partitions and floors of the same houses if their temperatures were permitted to increase 1 F deg.

The recommended heat storage allowances should be used with caution since the conduction unit heat gains used to calculate conduction load must be consistent with those found by the analogue computer analysis.

Attention is called to the conservative size of the heat storage allowances in Table 4 as compared to the size of the allowances found in the analogue computer study. The al-

Table 5—Relationship of Heat Storage to Heat Gain by Conduction and Infiltration

Test House No.	No. of Stories	Foundation Type	Conduction Plus Infiltration	Specific Heat Method		Overall Method		Room by Room Method	
				Heat Storage for 1 deg F Rise	Storage in Percent of Cond. and Infil.	Heat Storage Rate	Storage in Percent of Cond. and Infil.	Heat Storage Rate	Storage in Percent of Cond. and Infil.
			Btuh	Btu	Percent	Btuh	Percent	Btuh	Percent
2	2	Crawl	51,600	9,200	17.8	5,160	10	4,630	9.0
3	1	Crawl	26,920	2,560	9.5	1,350	5	1,620	6.0
8	2	Basement	30,670	8,590	28.0	4,600	15	3,270	10.7
9	1	Basement	24,760	7,800	31.5	2,480	10	2,930	11.8
11	1	Basement	25,820	8,100	31.4	2,580	10	2,000	7.7
13	2	Basement	22,100	10,200	46.2	3,315	15	2,565	11.6

Table 6—Test House Loads Calculated with Heat Storage Allowance

House No.	Steady State Installed Capacity	Heat Storage Method Installed Capacity	Capacity Satisfactory
	Percent	Percent	
1	60	74	No
2	103	112	Yes
3	79	84	Yes
4	75	82	Yes
5	44	—	—
6	134	—	—
7	62	77	Yes
8	75	88	Yes
9	83	99	Yes
10	78	84	Yes
11	74	80	No
12	75	81	No
13	56	61	No
14	79	87	Yes
15	68	83	No
16	64	78	No
17	86	108	Yes

Note: Heat gains calculated room by room. Indoor temperature 80 F. Duct allowances included.

lowance for a one story crawl space house is given as 5 percent which is less than half of the 13 percent determined for a one story house with heat gain through the floor. The allowance for a two story crawl space house is given as 10 percent which again is less than half of the 22 percent which was determined by the computer study.

The total sensible heat gains of the field test houses were recalculated using the room by room heat storage allowances. Table 6 gives the results as a percentage of nominal installed capacity. In all houses with 84 percent or higher installed capacity the owners were satisfied. However, the differences in occupants' desires indicate an ample reserve in the equipment selection. By contrast similar calculations omitting the heat storage allowance show that all houses with 76 percent or higher capacity had sufficient cooling.

If the heat storage allowances given in Table 4 had been increased to the full extent indicated by the analogue computer, the ratio of installed cooling capacity to calculated heat gain would have been over 90 percent for satisfactory cooling capacity. It is not recommended that full advantage of heat storage effects be taken at this time. Some margin for error is still needed to offset imperfectly balanced air distribution systems. The heat storage allowances recommended make adequate provision for normal internal loads.

The inherent characteristics of family usage of a home along with the external elements which result in a slight unbalance in temperatures between rooms, and possible variations in construction, indicate a definite need for a reserve allowance. As experience is gained in sizing equipment by the heat storage method, further refinement can be made in the heat storage allowances.

Conclusions

1. An electrical analogue computer can effectively solve the transient heat flow equations for a house.
2. Error in conduction, solar and infiltration heat gain factors does not account for the successful cooling of some residences with undersized equipment.
3. Heat storage capacity of unexposed interior partitions, floors, and ceilings is the reason for successful cooling with smaller sized equipment than needed to match the load calculated by the steady state method.
4. A reliable and practical relation has been established between house construction and heat storage.

References

1. Table 2, Chapter 13, HEATING VENTILATING AIR CONDITIONING GUIDE 1954, p. 269.
2. Cooling Load Calculation, Manual No. 11, 1953, p. 31 (*National Warm Air Heating & Air Conditioning Association*).
3. Cooling a Small Residence with a Two-Horsepower Mechanical Condensing Unit, by H. T. Gilkey, D. R. Bahnfleth and R. W. Roose (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, February 1953, p. 109).

Acknowledgment

The authors gratefully acknowledge the assistance of Alvin Nagler, Air Conditioning Division, General Electric Co., Bloomfield, N.J. who calculated the coefficients for the thermal circuits.

APPENDIX A

Description of Analogue Computer Technique

The analogue computer technique used in these studies was based on the simple heat balance equation. On this basis the conversion of the thermal circuit to an analogue computer diagram follows a direct course which will be outlined.

Consider first a typical junction in the thermal circuit and its adjacent junctions, Fig. A-1. Junction (2) is the junction under consideration. Junctions (1) and (3) are the adjacent junctions and may have thermal resistances and thermal capacities associated with them but not shown. R_{12} represents the thermal resistance between junctions (1) and (2) while R_{23} represents the thermal resistance between junctions (2) and (3). C_2 represents the thermal capacity of junction (2).

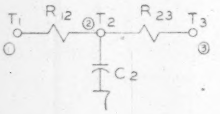


Fig. A-1 — Typical junctions in a thermal circuit

The equation for heat balance at junction (2) may be written as follows:

$$(T_1 - T_2)/R_{12} + (T_3 - T_2)/R_{23} = C_2\,(dT_2/dt)$$

Using the operator notation, $p = d/dt$, and transposing the equation, this becomes

$$T_2\,(1/R_{12} + 1/R_{23} + C_2p) = T_1/R_{12} + T_3/R_{23}$$

This equation is now in such a form that it may be directly identified with a simple analogue computer circuit.

A suitable analogue computer circuit is shown in Fig. A-2.

Table A-1

	Thermal	Electrical Analogue
Resistance	1 unit = 1 F deg/1000 Btuh	1 unit = 1 megohm
Capacity	1 unit = 1000 Btu/1 F deg	1 unit = 1 microfarad
Time	1 unit = 1 hour	1 unit = 1 second
Temperature	1 unit = 1 F deg	1 unit = 1 volt

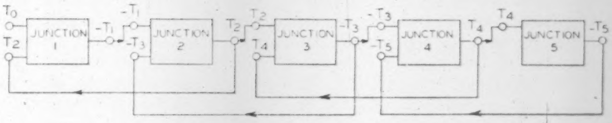


Fig. A-4—Computer diagram

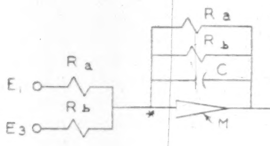


Fig. A-2—Analogue computer circuit

represents the high gain operational amplifier.

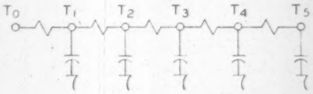


Fig. A-3—Thermal circuit

The junction marked * in Fig. A-2 is frequently called the summing point. The operational amplifier is a high gain d.c. amplifier, sign reversing, with negligible input current drain. If the gain of the operational amplifier is sufficiently high the voltage which exists at the summing point, *, is always completely negligible with respect to E_1, E_2, and E_3. The current balance equation for the summing point may be written as follows.

$$E_1/R_a + E_3/R_b = -E_2 (1/R_a + 1R_b + C_p)$$

With the exception of the change in sign, this equation has the same form as the heat balance equation derived for the thermal circuit. The resistances of the computer circuit may be directly identified with the thermal resistances. The capacitor of the computer circuit may be identified with the thermal capacity. The voltages of the analogue circuit may be identified with junction temperatures.

Thermal resistances are customarily written in terms of reciprocal Btuh. The electrical units correspond to a relation where resistance is written in terms of reciprocal coulombs/sec. A simple direct conversion from thermal to electrical units will result in one hour of thermal problem time corresponding to one second of analogue computer time. Since this time scale was convenient it was used in the studies described. The conversion factors used are as shown in Table A-1.

The total analogue computer circuit for a thermal structure consists only of the interconnected operational units for the individual junctions. Fig. A-3 shows a typical circuit involving a temperature source, T_o, and a five junction structure (assumed insulated at the far end). Fig. A-3 shows the interconnection of operational units for the structure. The operational units would have diagrams as shown in Fig. A-4.

APPENDIX B

House Characteristics

Wall Constructions were:

1. Frame consisting of 10-in. bevel cedar siding, 35 lb building paper, 25/32-in. shiplap sheathing, 2 × 4-in. yellow pine studs on 16-in. centers, 3/8-in. decorated gypsum board.

2. Brick veneer consisting of 4-in. brick, 35 lb building paper, 25/32-in. shiplap sheathing, 2 × 4-in. yellow pine studs on 16-in. centers, 3/8-in. decorated gypsum board.

3. Heavy masonry consisting of 4-in. face brick, 4-in. cinder aggregate blocks (15 × 4 × 8-in.), 20 lb building paper, 21/32-in. square furring strips, 3/8-in. decorated gypsum board.

All windows were single glass with nominal areas of 15, 25, and 38 percent of gross wall area. Window shading consisted of awnings, venetian blinds or no shading at all. Compass orientations were: front of house facing West, or front of house facing North. Houses were either one or two story.

The floor consisted of 2 × 8-in. joists on 16-in. centers with 25/32-in. sub-flooring, 35 lb building paper and 13/16-in. hardwood finishing. The roof consisted of 2 × 6-in. rafters on 16-in. centers, 25/32-in. wood, 55 lb building paper, and triple asphalt shingles. The ceiling consisted of 3/8-in. decorated gypsum board, 2 × 6-in. joists on 16-in. centers, and 4-in. blanket insulation. Interior partitions consisted of 3/8-in. decorated gypsum board on each side of 2 × 4-in. studs on 16-in. centers.

The single story house was 48 ft across the front, and had a floor area of 1308 sq ft and a volume of 10,400 cu ft. The two-story house was very nearly square, had a floor area of 654 sq ft on each story, and also had a volume of 10,800 cu ft. For each house approximately 100 sq ft of wall area was protected from solar radiation by an attached garage. Shading due to eaves was negligible and was neglected. Each house had a basement and an attic.

DISCUSSION

C. F. Kayan, New York, N. Y. (Written): It is indeed encouraging to see further development of some of the past work on thermal circuits and electrical simulation techniques presented at various times before the Society[1, 2, 3] during the past dozen years. This paper represents real progress, and the authors are to be commended heartily for contributing to it. Previous papers presented to the Society on building heat flow by electrical analogue analysis have dealt with separate elements of construction such as building structure, walls under transient conditions and steady-state conditions,[2] and radiant panels with embedded pipes under steady state.[3] It is particularly interesting that here we deal with a complete *house complex*.

The thought of comparison between calculation techniques, both mathematical and by *computer*-systems, with actual physical performance under operating conditions is a most excellent and progressive idea, heartily to be commended and to be further encouraged for the future. It is only by such comparisons that ultimately our computational methods will be advanced to a successful level. In the present case, in order to make this comparison most effective, it would be helpful if the authors would provide the basic information concerning heat flow conductances and resistances entering into their parallel solution by analogue computer, as well as further technical detail on the procedure in carrying out the evaluation for one particular case analyzed.

R. G. Vanderweil, Boston, Mass.: I should like to ask the authors whether they found a simple relationship between actual cooling requirements and theoretical cooling load computations. According to

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[1] Periodic Heat Flow in Building Walls Determined by Electrical Analogy Method, by Victor Paschkis (ASHVE Transactions, Vol. 48, 1942, p. 106).

[2] Effects of Floor Slab on Building Structure Temperatures and Heat Flow, by C. F. Kayan (ASHVE Transactions, Vol. 53, 1947, p. 377).

[3] Electrical Analogger Studies on Panels with Imbedded Tubes, by C. F. Kayan (ASHVE Transactions, Vol. 56, 1950, p. 205).

the experience gained on test homes, can we assume that we can safely cut — say — 15 percent from the cooling load computed according to The Guide? If so, could we still consider the installation as one providing proper comfort? I have heard a number of discussions on this subject lately, between engineers and manufacturers, and it would be interesting to see what an actual test on 16 homes would indicate regarding possible reduction of installed refrigeration capacity compared to that computed.

C. S. Leopold, Philadelphia, Pa.: As you know the word comfort has never been defined in our work nor do we have a formal definition in the TAC on Sensations of Comfort.

Not long ago I proposed somewhat facetiously the condition that people would want if they did not have to pay for the result and did not know that a test was being conducted. I think it is important when discussing conditions that people will *merely* accept, to take cognizance of what they will eventually *want* regardless of what they pay for it.

S. F. Gilman, Syracuse, N. Y.: I am very pleased to see this type of information made available and also that more and more investigators are working on the very important problem of thermal storage.

The authors state that their thermal storage factors can be used with any cooling load calculation method. However, a previous discussor stated that there is no standard method and advocated that a method acceptable as a standard be developed. Were the results in this paper correlated with The Guide method? If not, with which load calculation procedure?

In setting up the analogue, the four exterior walls were replaced by a composite wall, and the procedure is said to be justifiable on a theoretical basis. However, I doubt that it can be so justified unless a simplifying assumption is made; namely, that the radiant energy interchange between walls is negligible. If radiation effects are rigorously considered, I do not see how the four exposed walls can be replaced by a single equivalent wall, because the radiation angle factors introduce complex interdependent boundary conditions at the inside surfaces of the walls. If this simplification could actually be made, the work involved in the thermal storage research we are presently conducting would be reduced considerably. We are using the thermal circuit technique proposed by Nottage and Parmelee in a recent ASHVE paper.* With this method, the equivalent electrical circuit is set up and then solved analytically. For the usual residential problem, if the four walls could be replaced by a single wall, the number of simultaneous equations to be solved would decrease from 36 to 18, which represents a very considerable reduction in the time required to obtain a solution. Further discussion of the composite wall hypothesis by the authors is most desirable.

I note that the outdoor air temperature was taken as a sine curve. It should be pointed out that other investigators have shown that a Fourier series representation is required for good heat flow accuracy, and that three harmonics are ordinarily necessary for north and south walls and five harmonics for east and west walls. Since this analogue utilizes sine wave generators, it would be an easy matter to consider harmonics other than the fundamental. Work along this line is suggested as a next step.

One important fact has not been made clear either in the paper or the presentation. According to the equation for determining air conditioning capacity (appearing in the section, Heat Storage Allowance for Cooling Load Calculation), if the room air temperature is maintained constant the equipment capacity required is equal to the calculated heat gain. This means there is no thermal storage unless the room temperature varies. Therefore, if my interpretation is correct, this analogue has not considered the thermal storage in the exterior walls and roof of the structure that results from the periodic variation in outdoor temperature. The given value of 13 percent of the conduction and infiltration load, which at first appeared to me to be an extremely small amount of credit for thermal storage, looks reasonable if it actually accounts only for the thermal storage in the interior portions of the residences. This point needs clarification.

A. B. Newton, Wichita, Kan.: I have a question about Fig. 1. Is it true that we indicate that 99 percent of the people were happy or desired a temperature of about 85 F as a maximum temperature for comfort? I would appreciate the authors' comment on this chart.

Authors' Closure (Mr. Willcox): We appreciate Professor Kayan's kind remarks on the contribution made by this paper. The need for a more detailed explanation covering the various parts of the thermal circuit is recognized. In the interests of showing the overall picture covering a rather voluminous study some worthwhile subjects were drastically compressed. It is our intention to prepare future papers on analogue computer analyses and go into more detail on specific phases.

Dr. Gilman has asked by what heat gain load calculation method the results were obtained for correlation with thermal storage factors. The method used was the one which we developed several years ago. The method recently recommended by the *National Warm Air Heating and Air Conditioning Association* is basically the same in procedure and end results as the authors' method used before the completion of these analogue computer studies. The *ARI* method or any similar method giving basically the same end results would be similarly satisfactory with a reasonable storage allowance factor consistent with the method used and providing it is based on instantaneous peak load or a peak load averaged over a short time such as 3 or 4 hr. The actual heat storage allowance will be changed slightly depending on the heat gain method used. The paper illustrates how to find the magnitude of the heat storage effect and correlate it with any acceptable heat gain calculation method. Three simplifications questioned by Dr. Gilman were: (1) A single composite outside wall replacing the four individual outside walls; (2) omission of reradiation and the resultant interaction of one internal wall temperature on another; (3) the use of a sine curve for periodic outdoor temperature variations. These simplifications were justified on the basis of a comparison of computer load results with published test results from the University of Illinois as explained in the paper and other carefully correlated studies. Dr. Gilman points out one of the compelling reasons for such simplification — the practical necessity for reducing the bulk of simultaneous equations to be solved on a computer of limited size.

One further point raised by Dr. Gilman is the interpretation of the equation:

$$Q_o = Q_1 - (C_I + C_a)\ (dT_a/dt)$$

This shows that equipment capacity must equal room heat gain so that room temperature does not rise. Room heat gain is only a portion of the heat absorbed by the exterior surfaces of a house. Some of the heat entering exterior surfaces is stored in the walls and given back outdoors at a later time. Likewise some is given to the room after a time delay. This time delay effect on the outer walls is very carefully taken into account in the thermal circuits and is explained in some detail in the section on the thermal circuit.

Mr. Leopold's comment on the definition of *comfort* brings out an interesting phase of this work. In order to determine from personal interviews the indoor temperatures acceptable to users based on their experiences in living with air conditioning they were asked *What is the highest acceptable indoor temperature in the summertime?* and *What is the lowest acceptable, etc?* The questions indicate that *comfort* is relative over a range of temperatures and that owners will accept some variation. Answers were, of necessity, based on the indoor dry-bulb temperature shown by thermostat, thermometer and on individual preferences. Plotting the numerical answers to these questions gave the results shown in Fig. 1.

To Mr. Newton's question on the meaning of Fig. 1, we can answer that the points

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*Circuit Analysis Applied to Load Estimating, by H. B. Nottage and G. V. Parmelee (ASHVE Journal Section, *Heating, Piping & Air Conditioning*, June 1954, p. 157).

on the upper curve give maximum indoor temperatures and percentages of the sample users who would accept that maximum temperature *or a lesser* temperature. For the point mentioned and with a true probability curve only one percent of the users would accept an indoor temperature higher than 85 F.

Mr. Vanderweil's comment requests a simple relationship between calculated load and actual. This paper gives for residences a heat storage allowance which is simple to apply. The method has been successfully used on a substantial number of homes of various architectural designs and construction materials. Future advances in the art may further simplify the utilization of heat storage for cooling load reduction.

AUTHORS' CLOSURE (Mr. Oergel): The wall has been represented by a Pi circuit, three resistances and two capacitances, for which there will be two first order differential equations. When solving a heat flow problem, it is first necessary to determine the temperatures. The wall equations should be written in terms of temperature and the temperature of the capacitance closest to the indoor house temperature determined. This will be a second order differential equation, and there will be one for each one of the four walls.

These equations are now to be converted to heat flow equations, *i.e.*, differential equations which determine heat flow instead of temperature. The heat flow per square foot of wall is written in terms of conductance, capacitance to the air in the house, and the temperature difference. This expression is then used to convert the temperature equation to the heat flow equation. Now the four walls are alike, at least they were assumed to be so in the houses we calculated. Therefore, the left-hand sides of the differential equations for the four walls will be identical. Only the imposed or impressed functions on the right-hand sides of the equations will differ, particularly the sun loads.

Each wall equation is multiplied by the respective wall area and the four equations are added. The form of the left-hand side will remain unchanged except that it contains total heat flow while the right-hand sides will add to give the total impressed loads. This equation shows that the total wall heat flow can be reproduced by applying the total sun load to a composite wall, a single Pi circuit.

This equivalence of composite wall and the four separate walls is only true for heat flow. It is not true for temperatures. It is, therefore, not possible to probe into this composite wall circuit to determine temperatures. This is easily seen. I think it is rather obvious, because with the sun shining on the West wall but not on the East wall, it is certainly clear that the outside wall temperatures and hence temperatures throughout the two walls, will differ. We have used the composite wall only for heat flow measurements.

HPACCNA ANNOUNCES NEW BOILER-BURNER CODE

The *Heating, Piping and Air Conditioning Contractors National Association* announces the publication of a new 8 page *Testing and Rating Code for Boiler-Burner Units* developed by its Boiler Output Committee.

The new code represents "a sincere and determined effort to bring order out of confusion and chaos that exist today in the field of commercial boiler-burner units." It is the result of work started about three years ago.

The term "commercial" size is defined as a boiler-burner unit having a net load rating of 3000 sq ft of steam radiation or higher — 720,000 Btu per hr.

This new performance code gives wide and complete latitude to all manufacturers and designers. Safe limits are established for maximum operating conditions and *Net Load Rating* may be determined by use of a factor for piping, pickup and possible overload.

Several associations of manufacturers were invited to join the *HPACCNA* in the preparation of this code. Among those so invited, the Steel Boiler Institute accepted and their engineering committee participated.

The test section of this code is based on the American Society of Mechanical Engineers power test code for stationary steam-generating units, 1946 edition, which covers boilers of any type, size and operating pressure, fired with any fuel, and including superheaters, economizers and air heaters. This condensed code will serve the purpose of testing and rating the commercial sizes of boiler-burner units and steam generators when used for heating purposes. It has been built around the "Short Form, ASME Test Report."

The object of this testing and rating code is to provide the basis of rating commercial sizes of steel heating boilers with burner units, fired with oil or gas fuel. All boilers must be constructed in accordance with the ASME Boiler Construction Code.

Any architect, consulting engineer, building commissioner, air pollution authority, Federal authority, heating contractor or interested member of the industry may obtain one complimentary copy. Requests should be made on company letterhead to the *Heating, Piping and Air Conditioning Contractors National Association*, Suite 1843, 30 Rockefeller Plaza, New York 20, N. Y. Additional copies can be purchased at $1.00 per copy.

Questions and comments may be addressed to G. P. Nachman, chairman of the Boiler Output Committee, 1775 East 45th St., Cleveland 3, Ohio.

HEATING & VENTILATING SHOW ADVISORY COMMITTEE

Announcement has been made of the Advisory Committee for the 12th International Heating and Ventilating Exposition, under the chairmanship of Pres. L. N. Hunter. The exposition is to be held at the Commercial Museum and Convention Hall at Philadelphia, January 24-28, 1955 in conjunction with the 61st Annual Meeting of the ASHVE. The Society's headquarters will be at the Bellevue-Stratford Hotel.

ASHVE members on the Advisory Committee include J. E. Haines, Minneapolis, Minn., first vice president; E. R. Queer, State College, Pa., treasurer; P. B. Gordon, New York, N.Y., member of Council; R. S. Dill, Washington, D.C., chairman, Committee on Research; as well as M. F. Blankin, Philadelphia, Pa., and H. P. Gant, Glenmore, Pa., past presidents. Also L. M. Church, president, Philadelphia Chapter; E. H. Taze, president, Baltimore Chapter; R. L. Stinard, president, New York Chapter; H. M. Patrick, president, North Jersey Chapter; E. C. Hach, president, Pittsburgh Chapter, J. W. McElgin, general chairman 61st Annual Meeting; and C. S. Leopold, consulting engineer of Philadelphia.

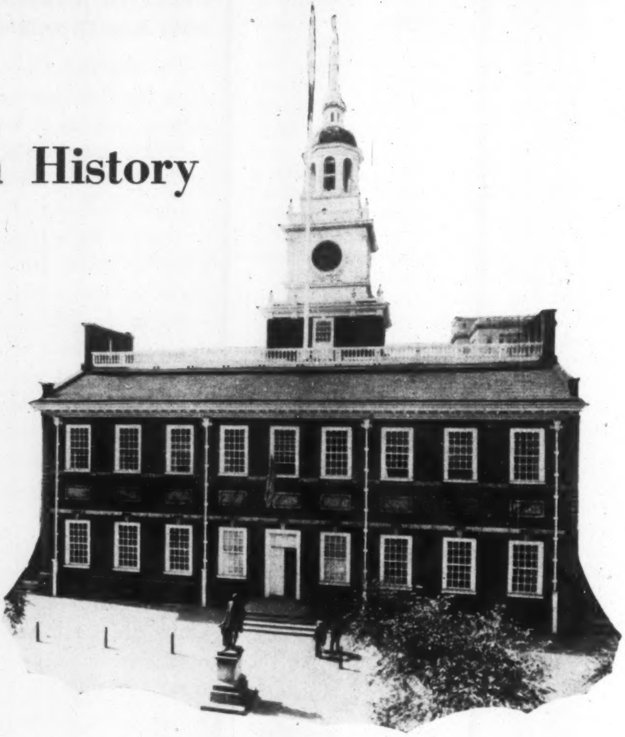
Additional members of the committee representing trade and engineering groups allied with the industry remain to be announced.

Relive Early American History In ASHVE Annual Meeting City

Bellevue-Stratford Hotel
Philadelphia, Pa.
January 24-27, 1955

✦ ✦ ✦

12th International Heating, Ventilating, Air Conditioning Exposition
Commercial Museum



Independence Hall

THE 61ST ANNUAL MEETING of the Society and the 12th International Heating, Ventilating, Air Conditioning Exposition, January 24-27, 1955, will provide members and their families an opportunity to visit the many historic buildings and points of interest in Philadelphia, the Cradle of Liberty. A schedule of airline and rail fares is shown on p. 161 for members' information.

Meeting headquarters will be in the Bellevue-Stratford Hotel, and the Exposition will be at the Commercial Museum. Nearly 400 exhibitors have reserved space, making this the largest show ever held, according to the International Exposition Co., manager of the ASHVE-sponsored exposition.

The Meeting will open Monday morning, at which time members and guests will receive the Philadelphia Chapter's official greeting, and the Exposition will open at 12:00 noon. B. H. Spurlock, Jr., chairman of the Program and Papers Committee, has announced that there will be four morning technical sessions scheduled Monday through Thursday, consisting of the presentation of three papers at each session. The general theme on Monday morning will be Air Filtration, Air Cleaning and Air Purification. Tuesday morning's program will consist of papers on Heat Transfer and Building Insulation. Continuing, Professor Spurlock explained that the three papers for Wednesday would be on the general theme of Cooling Loads, and the final session on Thursday would consist of three papers on Systems Operating Data.

Once the national capital, 1790 to 1800, Philadelphia is steeped in the history of early America, the Revolutionary period and the years which followed.

Early Philadelphia was quite a contrast to the crowded, bustling business and industrial city of today which plays such a prominent role in the economy of the country. Vividly bringing home the change in pace between today and 200 years ago is a walk through Elfreth's Alley, which not only is that old but still retains much of its early Philadelphia atmosphere.

Very few visitors to Philadelphia fail to see its most famous points of interest, Independence Hall and the Liberty Bell. But, many leave without knowing until too late that they have passed up Congress Hall, Betsy Ross's Home, Benjamin Franklin's grave, etc.

By budgeting time between the Annual Meeting and the Exposition, it should be possible to take in all of the well-known Philadelphia landmarks associated with American history.

The most convenient and direct way of touring Philadelphia is to take one of the planned sight-seeing tours of the city. Information concerning the schedules of these tours usually can be obtained at any hotel. For those who prefer to roam the city at their leisure, selecting particular places to visit, a helpful aid is the Street and Transit Map of Philadelphia which can be purchased in the hotel or at a newsstand.

One such *private tour* might include Independence Hall, Congress Hall, Betsy Ross Home, and Christ Church. This is the church where Washington and Franklin worshiped, and where the prayer book is displayed which a Revolutionary clergyman edited on July 4, 1776 to delete prayers for the king.

From 6th Street off Independence Square, it is a short walk to 244 South 3rd, the home of Samuel Powel, mayor of Philadelphia before and after the Revolution. For a small charge this home may be entered, and it is like stepping back to Colonial times. After imagining what it was like when Washington visited there, check the street map to determine where Carpenter's Hall is. From the Hall, in the same area, look for some of the buildings there such as the Shippen-Wistar House.

For a visual history of early Philadelphia, visit the Atwater Kent Museum where there are scale models of the city, the people, their clothing, and their homes.

Another interesting trip is the bus ride to Valley Forge. On the way the bus travels through lovely suburbs which still reflect their early English background. Valley Forge today is a 1500 acre park and the site of the Washington Memorial Chapel. Standing there, in such a tranquil atmosphere, it is difficult to believe that Washington and 11,000 Continental Army soldiers spent the winter of 1777-78 there, burying 3000 who died of sickness, hunger and cold.

Another short trip which should be taken is the Chestnut Hill train to Germantown. Among the colonial buildings still standing there are the Morris House at 5442 Germantown Ave., and the Germantown Academy on Schoolhouse Lane. The Morris home was the nation's White House in 1793 and 1794, and the only building still standing today which Washington lived in while President Washington's adopted son attended school at the Academy which is located just around the corner. There are many other historic buildings on Germantown Avenue, and it is a pleasant and inspiring walk.

These are some of the many historic points of interest. In addition, Philadelphia boasts of many other famous buildings, such as the University, Museum, Museum of Art, Rodin Museum, Franklin Institute Museum, and the Academy of Natural Sciences.

For entertainment there are night clubs, theaters, concerts, and sporting events.

Next month a description of unusual Philadelphia restaurants will appear in the JOURNAL.

Come to Philadelphia and join friends and fellow-members in this 61st Annual Meeting. A Welcome Tea on Sunday afternoon will begin the social aspect of the meeting, and the Entertainment Committee is planning a pleasant Get-Together for Monday evening. The Banquet committee has arranged for Dr. Milton S. Eisenhower, president, the Pennsylvania State College, to be the featured speaker at the Annual Banquet Wednesday evening. Several very pleasant social activities have been planned for the ladies, including a luncheon style show, theater party and sight-seeing. Plan now to have an enjoyable time in Philadelphia next January 24-27.

Typical Airline and Railroad Rates between Philadelphia and Chapter Cities

Airline*

	ROUND TRIP
Atlanta, Ga.	$ 86.00
Boston, Mass.	34.20
Charlotte, N. C.	58.85
Chicago, Ill.	78.94
Cincinnati, Ohio	64.70
Dallas, Tex.	158.00
Denver, Colo.	187.43
Des Moines, Ia.	115.71
Detroit, Mich.	52.91
Houston, Tex.	173.85
Los Angeles, Calif.	293.40
Memphis, Tenn.	110.20
Milwaukee, Wis.	79.00
New Orleans, La.	135.85
Omaha, Neb.	129.58
Portland, Ore.	293.36
San Francisco, Calif.	293.36
Seattle, Wash.	293.36
Washington, D. C.	16.30

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*Federal Tax included.

Railroad

	ROUND TRIP FIRST CLASS	ONE-WAY LOWER BERTH PULLMAN
Albany, N. Y.	$ 20.98	$ 5.91[a]
Atlanta, Ga.	56.42	8.65
Baltimore, Md.	8.58	.91[b]
Boston, Mass.	30.56	5.00
Buffalo, N. Y	36.25	5.00
Charlotte, N. C.	38.42	6.15
Chicago, Ill.	70.00	8.30
Cincinnati, Ohio	56.05	7.60
Cleveland, Ohio	41.25	5.00
Columbus, Ohio	46.20	6.15
Columbia, S. C.	45.07	6.90
Dallas, Tex.	101.98	15.70
Dayton, Ohio	52.20	6.90
Denver, Colo.	130.40	17.55
Des Moines, Ia.	90.90	11.55
Detroit, Mich.	55.05	6.55
Houston, Tex.	108.88	16.05
Indianapolis, Ind.	61.60	8.30
Jackson, Miss.	83.92	12.80
Kalamazoo, Mich.	65.45	6.55
Kansas City, Mo.	96.80	12.25
Little Rock, Ark.	85.43	12.25
Los Angeles, Calif.	194.33	27.95
Lubbock, Tex.	121.48	17.85
Memphis, Tenn.	79.42	11.55
Milwaukee, Wis.	75.00	9.95
Minneapolis, Minn.	93.75	11.55
Montreal, Que.	42.35	5.00
Newark, N. J.	7.26	.91[b]
New Haven, Conn.	16.40	2.41[b]
New Orleans, La.	$ 91.07	$12.80
New York, N.Y.	8.06	.91[b]
Norfolk, Va.	27.80	5.00
Oklahoma City, Okla.	103.38	15.00
Omaha, Neb.	99.05	12.25
Ottawa, Ont.	50.35	6.00
Phoenix, Ariz.	165.03	25.25
Pittsburgh, Pa.	30.75	5.00
Portland, Ore.	185.00	27.95
Sacramento, Calif.	194.33	27.95
St. Louis, Mo.	82.65	9.95
Salt Lake City, Utah	157.10	21.00
San Antonio, Tex.	116.33	18.10
San Francisco, Calif.	194.33	27.95
Santa Fe, N.M.	141.78	21.00
Seattle, Wash.	185.00	27.95
Shreveport, La.	92.93	14.10
Spokane, Wash.	167.05	24.95
Syracuse, N. Y.	33.30	5.91[a]
Toronto, Ont.	43.95	5.00
Tulsa, Okla.	100.03	14.80
Vancouver, B. C.	185.00	27.95
Washington, D. C.	12.02	5.00
Wichita, Kan.	103.38	15.40
Winnipeg, Man.	118.80	17.20
Winston-Salem, N. C.	33.77	5.50

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[a] Combination parlor seat and lower.
[b] Parlor car seat.

JOURNAL SECTION

COOLING LOAD DETERMINATION IS COMPLICATED PROBLEM

By C. O. Mackey*, Ithaca, N. Y.

The increasing complexity of engineering problems is providing much work for the Technical Advisory Committees of the Society. The problems related to improvement of the accuracy of cooling load calculations are of primary concern to the TAC on Cooling Load. They are complex because of the difficulty of accounting for heat storage in building structures and their contents, and the need for determining the heat flow into and out of buildings under conditions of periodic variation of temperature and solar intensity.

It is not difficult to obtain quick approximate answers to the many problems that face the air conditioning engineer, but to refine these answers, and to provide an optimum physical environment at minimum cost will require the concerted efforts of all members of the Society.

Supervision of Research Program

The TAC on Cooling Load maintains a close contact with the ASHVE Research Laboratory and with cooperating laboratories and organizations, for the purpose of planning research programs, reviewing the results of tests conducted, and translating the test results into practical design data.

Effect of Infiltration

Frequently one research problem is sufficiently broad in scope to include the interests of several TA Committees. This type of research problem is becoming increasingly common. As an example, the TAC on Heating Load has prepared a proposal for a research study on infiltration in one- and two-story houses. Accurate field measurements of infiltration are now possible by using tracer gas methods and a helium katharometer designed by the National Bureau of Standards. Since infiltration is a source of cooling load as well as of heating load, the TAC on Cooling Load must evaluate its interest in such a program.

Practical Results of Research

During the summer and early fall of 1953, the instantaneous rates of heat gain were computed and observed through three different roof sections at the Research Laboratory. Although it was found difficult to obtain several consecutive days in which the steady, periodic state could be realized without any net storage effects, enough tests have been completed to evaluate the agreement between mathematical theory and observed results. A research paper will be prepared by the Laboratory staff to report these results.

Effect of Lighting Load

The TAC on Cooling Load has had an interesting contact with the Illuminating Engineering Society through the medium of a joint committee to study the contribution to the cooling load from the lighting equipment of buildings. As an example of the many interests of this joint committee, the I.E.S. has asked the ASHVE members of the joint committee to prepare answers to the following three questions:

1. Is the assumption impractical that 100 percent of the lighting load eventually becomes part of the air cooling load? If not, why?
2. The equipment for some cooling systems is rated in horsepower, others in tonnage. What is the relation between them?
3. What are the elements of cooling load and their relative magnitude in typical installations?

Tentative answers to these questions have been prepared by committee members, and further progress is being made.

Cooperative Research

As an example of a contact with a cooperating institution, a project on Thermal Techniques Applied to Cooling and Heating Problems is being carried on at the University of California under a cooperative contract with the ASHVE. Some of this work has been reported to the Society. Dr. H. B. Nottage is now preparing a paper on results that were obtained from the use of computing equipment at Case Institute of Technology. In 1955, the project will emphasize the application of thermal circuit solutions to design problems.

Circuit Analysis Possibilities

A current problem of great importance is the improvement of cooling load estimates by the application of thermal circuit analysis. Consideration of the problem may lead to the recommendation that the Research Laboratory have an instrument suited to the study of heat and mass transfer in the unsteady state. The TAC on Cooling Load decided that a presentation of typical problems relating to the determination of cooling load and the performance of cooling systems might influence the recommendation as well as the design of such an instrument, if it should be thought desirable to have one. A subcommittee has been appointed to prepare such typical problems with complete physical data. In the order of their importance, it was suggested that these problems cover the contributions to cooling load that result from heat gain through glass, through roofs, from lighting, and through walls.

It is evident that through its work on the projects enumerated and on others that will be initiated the TAC on Cooling Load will have an opportunity to make a substantial contribution to the Society.

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*Chairman, Technical Advisory Committee on Cooling Load

NOMINATIONS FOR 1955

Officers and Council

The Nominating Committee, selected in accordance with the provisions of **Article VIII**—*Section 3* of the By-Laws, has submitted the following nominees for Officers and members of Council for 1955:

President
JOHN E. HAINES, Minneapolis, Minn.

First Vice President
JOHN W. JAMES, Chicago, Ill.

Second Vice President
PETER B. GORDON, New York, N.Y.

Treasurer
E. R. QUEER, State College, Pa.

Members of Council

Three-Year Term
BERT W. FARNES, Portland, Ore.
CARY B. GAMBLE, New Orleans, La.
WALTER A. GRANT, Syracuse, N.Y.
DANIEL M. MILLS, Houston, Tex.

One Year Term
R. T. KERN, Fitchburg, Mass.

Respectfully submitted,
NOMINATING COMMITTEE

M. S. Wunderlich, *Chairman*
John Bonner, *Vice Chairman*
A. O. Roche, Jr., *Secretary*
J. F. Collins, Jr.
G. T. Donceel
Fred Janssen
R. L. Kent
G. A. Linskie
H. G. S. Murray
H. E. Russell
W. O. Stewart
T. C. Caskey, *Alternate*

Members of Committee on Research

The election of the Committee on Research is governed by the By-Laws for the election of Officers, with the exception that members of the Committee on Research are nominated by the Council.

In accordance with the provisions of **Article VII** — *Section 3 (h)* the Council announces the nomination of the following members of the Committee for election to succeed those members whose present terms expire January 1955.

Committee on Research (*Three-Year Term*)

RAY C. CHEWNING, Portland, Ore.

WARREN S. HARRIS, Urbana, Ill.

NEIL B. HUTCHEON, Ottawa, Ont., Canada

BURGESS H. JENNINGS, Evanston, Ill.

ROBERT A. MILLER, Pittsburgh

Nominations and Voting

Article VII

Section 3. General Committees. ....

(h) Committee on Research, consisting of fifteen (15) MEMBERS, nominated by the Council or as provided in *Article VIII, Section 4*, and elected by the Society in the manner of elected officers. ....

Article VIII

Section 4. Other Nominations. Nominations of officers and members of the Council, other than those nominated by the Nominating Committee, and nominations of members of the Committee on Research, other than those nominated by the Council, may be made in writing by at least fifty (50) members eligible to vote, upon presentation of such nominations, with each nominee's consent, to the Executive Secretary at least sixty (60) days prior to the opening of the first session of the Annual Meeting, whereupon the nominees' names shall be placed upon the ballot with a notation that they are presented by members independent of the Nominating Committee.

Section 5. Voting. Voting at any meeting may be in person or by proxy, but only the Executive Secretary and MEMBERS of the Society shall be eligible to act as proxies. Proxies shall not be valid for more than three (3) months from dates of execution. The Executive Secretary and the MEMBERS acting as proxies shall hold the ballots of their principals secret and confidential. Voting for election of officers, Council members, members of the Committee on Research, on proposals to amend these By-Laws, and on questions required to be referred to the Society pursuant to *Article V, Section 2*, shall be by secret ballot. In the event of any tie vote, the Council shall decide the vote.

Section 6. Ballots. Together with notice of the Annual Meeting, the Executive Secretary shall forward appropriate proxies and ballots to members entitled to vote. The proxies and ballots shall contain spaces for write-in names.

In accordance with the provisions of the Society's By-Laws, proxy ballots containing the names of the candidates will be sent to the membership prior to the Annual Meeting in January.

JOURNAL SECTION

NOMINEES FOR 1955

OFFICERS

FOR PRESIDENT—JOHN E. HAINES, vice president, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has spent almost his entire career with the company in various capacities. He is presently in charge of the Commercial Controls Division in Minneapolis. Previous to his succession to the vice presidency in 1945, he served the Modutrol Division as manager of the New York office and assistant manager of its Minneapolis division, was manager of the National Regulator Division, Chicago, and became manager of the Commercial Controls Division in 1940.

J. E. Haines
Minneapolis, Minn.

Mr. Haines was born in Noblesville, Ind., on November 8, 1903, attended Purdue University, and was graduated in 1925 with a B.S. in chemical engineering.

A member of the Society since 1940, Mr. Haines served as general chairman of the Committee on Arrangements for the Semi-Annual Meeting held in Minneapolis in 1949. He has served on the following committees: Chapter Delegates, 1945-46; Nominating, 1945-46 and 1948, serving as chairman in 1947; Ways and Means, 1951; Membership, 1951-52, serving as chairman 1952; Finance, 1953; and acted as chairman of Promotion of Research, 1947-49; Chapter Relations, 1950-51; and Long-Range Planning, 1953-54. At present, he is a member of the ASHVE-*ASRE* Joint Committee and the special committee on Exposition Rates, as well as chairman of the Executive and F. Paul Anderson Committees. Since 1950, Mr. Haines has served on the Council, and was elected second vice president in 1953, and first vice president in 1954. He has also held the offices of president and vice president of the Minnesota Chapter.

The author of a textbook, *Automatic Control of Heating and Air Conditioning*, published in 1953, Mr. Haines has written and lectured extensively on automatic controls and their application. He is a member of the *ASME*, *ASRE*, *National Sales Executives*, *Building Research Advisory Board* and the Delta Chi Fraternity. He is also Director of the *Producers Council*.

FOR FIRST VICE PRESIDENT—JOHN W. JAMES, vice president of research, McDonnell & Miller, Chicago, Ill., served the Society from 1935-43 as technical secretary.

Born in Brookville, Ind., on January 12, 1907, Mr. James received his B.S. in mechanical engineering from Oregon State College in 1928. Following four years of association with a consulting engineer in Portland, he accepted a research fellowship at the University of Wisconsin, gaining his M.S. in 1934. He worked in the laboratory of the General Electric Co. in Schenectady, N.Y., acted as research adviser and instructor at the Polytechnic Institute of Brooklyn and participated in design and development work with Iron Fireman Manufacturing Co., Cleveland, previous to joining the McDonnell & Miller organization.

John W. James
Chicago, Ill.

He completed a term on Council last year, where he served as chairman of the Program and Papers Committee in 1949, and is at present a member of the Executive Committee and chairman of the Finance Committee. He was elected to two terms on the Committee on Research, serving as vice chairman in 1949, held membership on the TAC on Panel Heating and Cooling, has been chairman of the TAC on Hot Water and Steam Heating since 1950, and is a member of the TAC on Physiological Research. He currently assists on the Long-Range Research Program and Long-Range Planning Committee, and has also worked on the Publication, Constitution and By-Laws, Nominating, Publication Policy, and Guide Committees.

A registered professional engineer in the States of Oregon and Ohio, Mr. James is a member of Sigma Xi, Pi Tau Sigma, Phi Sigma Kappa, *Western Society of Engineers*, and *American Society of Sanitary Engineers*. He is active on the Research Committee of the *National Association of Manufacturers*, and is a member of the *American Society of Mechanical Engineers*, serving on its Low Pressure Heating Boiler Code Subcommittee.

Mr. James was a contributor to the 12th edition of *Kent's Mechanical Engineers' Handbook* and associate editor of the 1949 edition of the *Handbook of Oil Burning*. He served as technical editor of THE GUIDE from 1936 to 1943, and is co-author of the textbook, *Heating and Air Conditioning*, by Allen, Walker and James.

FOR SECOND VICE PRESIDENT—PETER B. GORDON, vice president, Wolff and Munier, Inc., New York, N. Y., was born in Montclair, N. J., on August 15, 1907 and began work as a draftsman and estimator while an undergraduate at Rutgers University.

After graduating with a B.S. in civil engineering in 1928, Mr. Gordon worked with a New Brunswick contractor for a year. He then joined George E. Gibson, Co., New York City, later assuming charge of the heating and ventilating department. From 1936 on he has been connected with Wolff and Munier, Inc., acting as engineer, treasurer and director previous to gaining the vice presidency in 1951.

P. B. Gordon
New York, N. Y.

Mr. Gordon also has given courses in air conditioning at Brooklyn Evening Technical High School, was an instructor and adjunct associate professor at New York University Evening Engineering Division, and was a visiting lecturer in mechanical engineering at Princeton University.

A member of ASHVE since 1935, Mr. Gordon has been active on various committees: the Guide Publication Committee, as member from 1949-50 and chairman in 1951; TAC on Panel Heating and Cooling, as member 1947-49 and chairman 1949-54; Standards Committee, as member 1952-53 and chairman in 1954; Program and Papers Committee, 1952-53; Long-Range Planning and Building Committees, 1953-54; and is at present a member of the ASHVE-*ASRE* Joint Committee and the Ways and Means Committee. He has been a member of Council for the past two years, and also holds membership in *ASME*, *ASRE*, *ASEE* and the *Chemist's Club of New York*.

FOR TREASURER—E. R. QUEER, director and professor of engineering research, The Pennsylvania State University, State College, Pa., was born on May 26, 1904, in Johnstown, Pa. He studied electrical engineering at Pennsylvania State College, receiving his B.S. in 1926 and M.S. in 1928. Professor Queer has been associated with the College of Engineering in the field of research since graduation, serving on the faculty since 1928, and as director of engineering research since 1952. He has conducted extensive research, particularly in the fields of heat and moisture transfer, thermo-dynamics, adsorption by chemical desiccants, and in housing. He is the author of a number of books and technical papers.

Professor Queer has held the position of captain in the U. S. Naval Reserve since 1952. During World War II, he served for five years in the Air Conditioning Section of the Bureau of Ships, receiving commendations from Adm. C. W. Nimitz, and J. A. Forrestal, Secretary of the Navy. He now acts as a consultant to the Chief of Army Ordnance, the Bureau of Yards and Docks of the U. S. Navy, and several companies on long-term storage and preservation of military material, and the U. N. Permanent Headquarters on condensation control in the U. N. buildings.

E. R. Queer
State College, Pa.

Since he joined the Society in 1933, he has been on various committees, among which were the Technical Advisory Committees on Navy Studies, and on Air Sterilization, 1948, and on Insulation, 1939-49. From 1950-53, he was a member of Council, and is currently treasurer of the Society and a member of the Executive, Finance (ex-officio), Ways and Means, and Human Calorimetry Committees and ASHVE-*ASRE* Joint Committee. He also served on the following: Committee on Research, 1948-50; Admission and Advancement, 1945-47, and as chairman, 1947-48; Federal Liaison, 1949; and Program and Papers, chairman, 1951-52.

Registered as a professional engineer in the State of Pennsylvania, Professor Queer is also a member of the *Society of Naval Architects and Marine Engineers*, United States Naval Institute, *American Society of Naval Engineers*, *American Society for Testing Materials*, Sigma Xi and Theta Xi.

NOMINEES FOR COUNCIL—1955

(Three-Year Term)

B. W. Farnes
Portland, Ore.

Bert W. Farnes, owner, Bert Farnes Co., Portland, Ore., was born November 12, 1898 in Logan, Utah. A member of the Society since 1938, he is a charter member of the Oregon chapter.

President of the chapter in 1942, Mr. Farnes also has served the Oregon chapter as vice president, 1941; on the board of governors, 1940-43; as general chairman, State Fuel Conservation Program, 1942-45; member of the Oregon Chapter's Legislative Committee, 1944-45, and its chairman, 1945-46; general chairman, Air Conditioning Conference, 1938 and 1946; Social Committee chairman, 1946-47; Public Relations Committee chairman, 1947-48; Public Relations Committee, 1949-50; Conference Committee, 1950-51; Meetings Committee 1952-53; and general chairman of the 1951 Semi-Annual Meeting.

In addition to local chapter responsibilities, Mr. Farnes has served the ASHVE on various committees since 1941. That year through 1944 he served on the Nominating Committee. In 1946, 1948 and 1950 he was an alternate member of the Chapter Delegates Committee, and in 1952 and 1953 was an alternate member of the Chapters Conference Committee. In 1952 he again served on the Nominating Committee, and in 1953 was vice chairman of this committee.

Listed in *Who's Who in Oregon*, Mr. Farnes is also affiliated with the *Society of American Military Engineers, Instrument Society of America, American Society for Metals, National Aeronautical Association, Pacific Coast Gas Association* and *Old Timers of the Oil Heat Institute.*

C. B. Gamble
New Orleans, La.

Cary B. Gamble, partner in the firm of Cary B. Gamble & Associates, New Orleans, La., was born January 5, 1902 in Wilson, N. C., and received his B.S. degree in electrical engineering from Alabama Polytechnic Institute.

A member of the Society since 1935, Mr. Gamble is affiliated with the Delta Chapter which he served as vice president, 1940-41; and as president, 1941-42.

Mr. Gamble also served on the ASHVE Nominating Committee, 1951-52 and as chairman, 1953. He holds membership in the *Louisiana Engineering Society, ASRE, ASME, AIEE, NAPRE, Gulf Institute of Consulting Engineers*, International House, and the Engineers Club of New Orleans. Mr. Gamble also has published articles in *Skyscraper Management*, entitled, What to Expect in Air Conditioning, and Functional Design in Air Conditioning.

W. A. Grant
Syracuse, N. Y.

Walter A. Grant, vice president, Central Engineering Staff, Carrier Corp., Syracuse, N. Y., was born August 27, 1904 in Brooklyn, N. Y. and is a graduate of Columbia University. He received his A.B., B.S. and M.E. degrees and has been affiliated with Carrier since 1928.

Mr. Grant joined the company as a student engineer and has served as application engineer, development engineer, Eastern regional chief engineer, director of application engineering and director of research.

A member of the Society since 1929, Mr. Grant has served on the Committee on Research, 1949-54; TAC on Odors, 1949-53; TAC on Sensations of Comfort, 1949-51; TAC on Air Distribution, 1952-53 and vice chairman, 1954; and the 1952 and 1953 Nominating Committees.

Co-author (with W. H. Carrier and R. E. Cherne) of the textbook, *Modern Air Conditioning, Heating and Ventilating*, Mr. Grant also has written numerous technical articles and has contributed material for The Guide.

Listed in *Who's Who In Engineering* and in *American Men of Science*, Mr.

Grant also holds membership in *ASRE*, *AAAS*, Tau Beta Pi, Sigma Xi, Phi Gamma Delta and University Club, and is a licensed professional engineer in New York and New Jersey.

D. M. Mills, manager, F. J. Evans Engineering Co., Houston, Tex., was born September 27, 1908 in Hanover, Ind., and was graduated from Purdue University in 1933 with a B.S. degree in chemical engineering.

D. M. Mills
Houston, Tex.

After serving with the Autogas Corp., Chicago, as sales and service engineer for conversion burners, Mr. Mills joined the staff of the Surface Combustion Corp., Toledo, Ohio in 1934 as sales engineer for space heating. He remained with this firm until 1938 when he spent a year with Dominion Refrigeration as their Ontario distributor at Toronto. In 1939 he became associated with the F. J. Evans Engineering Co., first as sales engineer for space heating in Birmingham, Ala., and then as manager of the company's Houston office, the position he now holds.

Since joining the Society in 1940, Mr. Mills has served one term as a member of the Council; Membership Committee, 1951-54, chairman 1953-54; Chapter Delegate, Chapter Relations Committee, 1951; Nominating Committee, 1946 and 1949-50, secretary 1950; and general chairman of the 60th Annual Meeting at Houston, Tex. He is associated with the South Texas chapter, serving as secretary in 1945, vice president in 1946, and president in 1947.

Mr. Mills is also a member of the *Houston Engineers Club*, *Southern Gas Association*, Blue Flame Council of Houston, Houston Rotary Club, and Houston Chamber of Commerce.

(One-Year Term)

Raymond T. Kern, chief engineer, the Jennison Co., Fitchburg, Mass., has contributed to several editions of The Guide. He is the author of papers on forced circulation, published in the Society's Journal and trade periodicals.

Mr. Kern was born on May 30, 1884 in Reading, Pa., and started as a draftsman with the Almirall & Co., Inc., New York, N. Y., in 1909. Three years later he joined McMullen, Riley, and Durley, Montreal, Canada, as a consulting engineer. In 1914, he became chief engineer of the Jennison Co. and has been with the firm ever since.

Massachusetts Chapter president in 1949, Mr. Kern has shown interest in local and Society affairs. He served on the Chapters Conference Committee in 1943 and 1948-50; Nominating Committee, 1944 and 1949, acting as chairman, 1950. In 1952 he was elected a member of Council and served on the Membership Committee, 1952-53. At present he is on the Program and Papers Committee. Mr. Kern is a member of the *National Society of Professional Engineers* and is a registered professional engineer in Massachusetts and New Hampshire. He is listed in *Who's Who in the East*.

R. T. Kern
Fitchburg, Mass.

NOMINEES FOR COMMITTEE ON RESEARCH — 1955

(Three-Year Term)

Ray C. Chewning, assistant, J. Donald Kroeker, Consulting Engineer, Portland, Ore., was born at Grand Junction, Colo., on August 29, 1914. He studied mining and electrical engineering at the University of Washington, and in 1938 became an assistant to J. Donald Kroeker, doing design and specifications for steam, hot water, and air conditioning systems. Mr. Chewning has been in this connection since that time except for five years army service. While in the army he was engaged in training men for and developing new methods in field artillery survey. He was a member of his camp's Fuel Conservation Board in England in 1943.

R. C. Chewning
Portland, Ore.

Since joining the Society in 1945, Mr. Chewning has been co-author with Mr. Kroeker of technical papers published in the Journal and Transactions. From 1952 until the present he has been a member of the TAC on Hot Water and Steam Heating. President of the Oregon Chapter in 1950, he also served as treasurer, 1946-47, and vice president, 1949, and is a member of the *Professional Engineers of Oregon*.

Warren S. Harris, research professor, department of mechanical engineering, University of Illinois, Urbana, Ill., has done considerable research on the testing and rating of automatic coal, gas and oil furnaces, boilers and water heaters.

Born on January 14, 1908 in Champaign, Ill., he attended Champaign High School and was graduated from the University of Illinois with a B.S. in mechanical engineering in 1930. Following a year as experimental engineer with the Union Carbide and Carbon Chemicals Corp., he returned to the University of Illinois in the dual capacities of special research assistant in mechanical engineering, and student majoring in heating and ventilating. In 1933 he received his M.S. in mechanical engineering, and went into industry until he rejoined the University as special research assistant, doing experimental work on steam and water heating. In the interim, he worked as a research engineer for a year with Philadelphia and Reading Coal and Iron Co., and from 1934 to 1940 with the Delco Appliance Division of General Motors, in charge of the products testing laboratory for most of this period. Professor Harris has remained on the University of Illinois research staff in successive positions from 1940 up to the present.

W. S. Harris
Urbana, Ill.

Soon after joining the Society in 1942, Professor Harris started taking an active part in committee work, beginning with membership on the Flow of Fluids through Pipes and Fittings Committee in 1944-45. He has been a member of the Heating Load Committee since 1945, acting as chairman in 1951-52; the TAC on Hot Water and Steam Heating since 1951; and the Panel Heating and Cooling Committee for eight years, 1947-50 with Group A, and 1951-54 with Group B. In 1951-52 he was a member of the Guide Committee, and became chairman in 1953. Professor Harris enjoys membership in Sigma Xi and Pi Tau Sigma, and is the author of several technical articles which have been published in the JOURNAL and TRANSACTIONS.

NEIL B. HUTCHEON, assistant director, Division of Building Research, National Research Council, Ottawa, Canada, was born March 13, 1911 in Rosetown, Saskatchewan, Canada. He is a 1933 graduate of the University of Saskatchewan, where he received a B.E. degree in engineering, and two years later an M.S. degree in engineering. Dr. Hutcheon then attended the University of London for two years where he received a Ph.D. in engineering.

N. B. Hutcheon
Ottawa, Canada

In 1937 he returned to the University of Saskatchewan as assistant professor teaching machine design, heating and ventilation until 1942 when he became professor of mechanical engineering. Since 1945 Dr. Hutcheon has devoted his time and efforts to teaching, research in heat and moisture flow in walls, and as a consultant in the design of a number of heating and ventilating systems. In addition, during 1949-50, he was a technical consultant to the Prairie Regional Station of the Division of Building Research, National Research Council, which was located on the University campus. During 1951, Dr. Hutcheon took a year's leave of absence from the University to spend time in Ottawa as a member of the Division of Building Research staff, which eventually led to his present position of assistant director.

A member of the Ottawa Valley Chapter of the Society, Dr. Hutcheon has been active on the following ASHVE committees: Committee on Research, 1952-54; TAC on Insulation, 1951, and vice chairman, 1952-54; TAC on Heat Flow Through Glass, vice chairman, 1952-54; and TAC on Heating Load, 1954.

Among the technical articles written by Dr. Hutcheon are two published by the Society, Moisture Migration in a Closed Guarded Hot Plate, 1952, and Thermal Performance of Frame Walls, 1953 (with G. O. Handegord).

Dr. Hutcheon is a registered professional engineer in Saskatchewan, and in addition to Society activities also is a member of the *Engineering Institute of Canada.*

BURGESS H. JENNINGS, chairman of the Department of Mechanical Engineering, Technological Institute of Northwestern University, Evanston, Ill., was born September 12, 1903, and received his B.E. from Johns Hopkins University in 1925 and his M.S. and M.A. from Lehigh University. After a period of industrial experience, he entered the teaching profession at Lehigh University, serving from 1925 to 1940. There he attained the rank of associate professor and served as director of the Mechanical Engineering Laboratories. In 1940 he was appointed professor of mechanical engineering at Northwestern and in 1942 assumed his present post.

Professor Jennings has also been an active consultant for many companies including the Frigidaire Division of General Motors and the Philadelphia and Reading Coal and Iron Co. During the War he served with the U. S. Office of Scientific Research and Development, investigating control of cross infection in living groups.

B. H. Jennings
Evanston, Ill.

Professor Jennings is a past president of the *American Society of Refrigerating Engineers* and has served in other offices and on a number of committees for that Society, including service as editor-in-chief of the Refrigerating Data Book for the 1949 and 1951 editions. He is a Fellow of the *American Society of Mechanical Engineers*, and past chairman of the Chicago Section. He has served on many committees of ASHVE, including the Guide Publication Committee, 1947-48, 1950-51, chairman, 1952; TAC on Air Sterilization and Odor Control, 1945-46; TAC on Air Sterilization, 1947-49; Committee on Research, 1952, vice chairman in 1953-54; TAC on Heating Load, 1952; Research Executive Committee, 1953-54; and the Research Long-Range Planning Committee, chairman 1953-54.

Among books which he has authored and co-authored are: *Air Conditioning and Refrigeration; Gas Turbine Analysis and Practice; Handbook of Toxic Gases and Vapors in Industry; Internal Combustion Engines;* and *Steam and Gas Engineering.*

Professor Jennings is a member of Tau Beta Pi, Pi Tau Sigma, and Sigma Xi. He is listed in *Who's Who in America, Who's Who in Engineering,* and *American Men of Science.* He was honored in 1950 as a recipient of the Richards Memorial Award of Pi Tau Sigma for outstanding achievement in mechanical engineering during the 25-year period, 1925-1950.

R. A. MILLER, technical sales engineer, Pittsburgh Plate Glass Co., Pittsburgh, Pa., was born July 20, 1889 at Canton, Ohio, and graduated from Yale University with an A.B. degree in 1911. Subsequently, he attended Massachusetts Institute of Technology as a chemical engineering major.

Following graduation, Mr. Miller was associated with a pharmaceutical company as research chemist. He enlisted in the Army in 1917, and after discharge managed a small chemical plant, and then was a research chemist for the United States Rubber Company's Regenerating Division, which position he left in 1921 to join the Pittsburgh Plate Glass Company. He has served this company in flat drawn sheet window glass development, as assistant superintendent of the Plate Glass factory, and since 1930 in the company's general offices in his present position.

R. A. Miller
Pittsburgh, Pa.

Since joining the Society in 1931, Mr. Miller has acted as chairman, TAC on Heat Transfer Through Glass, 1945-54; vice chairman, TAC on Air Conditioning Requirements of Glass, 1932-45; and on Group B of the TAC on Panel Heating and Cooling, 1948-54. He is affiliated with the Pittsburgh Chapter of which he was president in 1939.

Throughout 20 years' work on insulation, radiant energy control, etc., Mr. Miller has written numerous technical books and articles. He is author of Pittsburgh Plate's *Glass Manual*, and has had three articles published by the Society, as well as articles published by the *American Chemical Society*, and *American Ceramic Society*.

Mr. Miller was a member of the original SAE committee which developed the safety glass code for glazing automobiles. He is also a member of *ASME, American Chemical Society, American Ceramic Society, the Glass Technology Society of London*, and the *Pennsylvania Society of Professional Engineers.* He is listed in *Who's Who in the East.*

JOURNAL SECTION

Summary of Chapter Meetings

PRES. L. N. HUNTER PRESENTS CHARTER TO NEW MEXICO CHAPTER

The charter meeting of the New Mexico Chapter, held at the Fez Club in Albuquerque on July 26, was an evening of warm welcome to this new link in the Society. After the invocation by Morris Holman, Richard Bice, member of the Albuquerque City Commission, extended greetings to the Chapter, and Thomas McCarty, president of *N.M.S.P.E.*, invited all the New Mexico Chapter members to attend his group's August picnic.

Temporary officers who had been named were elected permanent officers. J. H. Van Alsburg, Santa Fe, first president of the Chapter, introduced ASHVE Pres. L. N. Hunter, Johnstown, Pa., who spoke on the growth, future and finances of the Society, as well as its aims and achievements. With an audience of sixty members and guests, President Hunter presented the charter to President Van Alsburg, and on behalf of South Carolina Chapter, he also presented a gavel.

J. K. James of Albuquerque, secretary of the New Mexico Chapter, was the recipient of the minutes and record books from A. V. Hutchinson, ASHVE Executive Secretary. Secretary Hutchinson discussed the organization of the Society, and A. J. Hess, *ASRE* president and ASHVE member of Council, noted the advantages of ASHVE Society membership.

President Van Alsburg explained the by-laws, which were accepted by the Chapter members, read the names of committees, and discussed the August meeting arrangements. The Chapter secretary was instructed to send letters of appreciation to all chapters and persons who wrote letters and sent telegrams congratulating the New Mexico Chapter. Attendance 60.

- *KANSAS CITY*: Pres. F. K. Ladewig presided at the August meeting, which covered several points of business. Meeting dates were announced, and the duties of committee chairmen outlined. Arrangements were made for the printing of Chapter stationery and of news release sheets for the public relations committee. The B.T.U. Breeze editor was instructed to prepare a guidance chart for future use by news editors.

A. S. Hurt, Jr. was appointed delegate to the ASHVE Chapters Conference Committee in January 1955 at Philadelphia. Plans were made for the annual fall party to be held in October, and there was discussion favoring a spring party. With a further eye to the future, the special events committee was instructed to urge the naming of Kansas City as the location for the Society's Annual Meeting in 1960.

- *MISSISSIPPI*: At the August meeting, Burt Lomax, Jr., and T. E. Stepan were named as member and alternate member of the Chapters Conference Committee. Mr. Stepan noted that both ASHVE and *ASRE* are considering incorporating the term 'Air Conditioning' in their organization's names. A majority vote recommended the forwarding of a letter to ASHVE Headquarters, favoring the exploration of a possible union of the two societies. Pres. I. E. Rowe read a letter from the newly organized New Mexico Chapter expressing appreciation for Mississippi Chapter's congratulatory message.

Guest speaker of the evening, N. F. England, representative of the Metalbestos Division, William Wallace Co., gave an interesting illustrated presentation on the *Theory and Practice of Venting Gas Burning Appliances*. Attendance 26.

- *NORTH TEXAS*: A thorough and effective talk on *High Velocity Air Distribution* was made by J. P. Licandro at the August meeting. Ross Zumwalt introduced the speaker, and a question and answer period followed.

D. C. Kieffer was named as a committee of one to receive and distribute donations to aid local ASHVE members stricken with polio. G. H. Meffert and M. W. Brown were named delegate and alternate to the Annual Meeting in Philadelphia,

NEW MEXICO CHAPTER OFFICERS

J. H. Van Alsburg
President

H. F. Munn
Vice President

J. K. James
Secretary

R. W. Haines
Treasurer

F. H. Bridgers
Board of Governors

C. R. Wherritt
Board of Governors

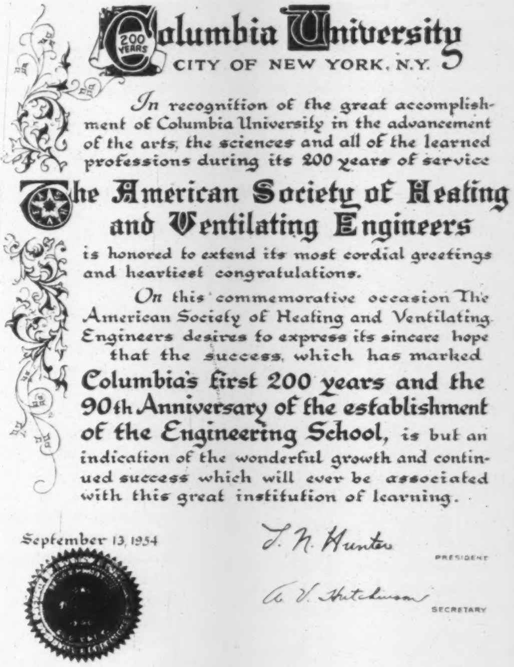
which a dozen North Texans hope to attend. A unanimous motion was made to invite the Society to hold the Annual meeting in Dallas in 1961.

On the social side, R. L. Patton extended an invitation to the *Producer's Council* Caravan, and members demonstrated interest in plans for a Christmas party. Attendance 95.

HUNTER SPEAKS AT COLUMBIA JUBILEE TECHNOLOGY WEEK

Pres. L. N. Hunter and other ASHVE members participated in the Conference on Refrigeration and Air Conditioning, September 13-14 at Columbia University, New York. The Conference was the first part of the Jubilee Technology Week arranged by the Department of Mechanical Engineering to commemorate the 1954 Bicentennial celebration of the University. Among the organizations assisting the chairman, Prof. Carl F. Kayan, were *TRRF*, *ASME*, *ASRE* and ASHVE.

Carl F. Kayan, Chairman
Jubilee Conference Committee



Columbia University
CITY OF NEW YORK, N.Y.

In recognition of the great accomplishment of Columbia University in the advancement of the arts, the sciences and all of the learned professions during its 200 years of service

The American Society of Heating and Ventilating Engineers

is honored to extend its most cordial greetings and heartiest congratulations.

On this commemorative occasion The American Society of Heating and Ventilating Engineers desires to express its sincere hope that the success, which has marked **Columbia's first 200 years and the 90th Anniversary of the establishment of the Engineering School,** is but an indication of the wonderful growth and continued success which will ever be associated with this great institution of learning.

September 13, 1954

L. N. Hunter
PRESIDENT

A. V. Hutchinson
SECRETARY

Scroll presented on behalf of ASHVE by President Hunter to Dr. John A. Krout, vice president of Columbia University

At the opening session, Monday, September 13, ASHVE Past Pres. Walter L. Fleisher, New York, N.Y., presented several well-known ASHVE members speaking on the general theme, Panorama of Progress in Air Conditioning. ASHVE President Hunter spoke on the subject, "Air Conditioning Research in the ASHVE: Its Progress and Development." Subsequent papers were presented as follows: "Past Research," C. M. Humphreys, Senior Engineer, ASHVE Research Laboratory, Cleveland; "Present Research," R. S. Dill, Washington, D.C., Chairman, ASHVE Committee on Research; "Future Research," E. R. Kaiser, Director of Research, ASHVE Research Laboratory; and "Climatological Factors in Air Conditioning," John Everetts, Jr., ASHVE, Philadelphia.

Chairman of the afternoon session was C. S. Leopold, Philadelphia, ASHVE member and past president of *ASRE*. He introduced W. A. Grant, Syracuse, N. Y., ASHVE, whose paper was entitled, "Modern Design Practice," and P. B. Gordon, New York City, ASHVE, speaking on, "Factors in the Conditioning of Modern Office Buildings." Two other members of the ASHVE were Justin Neuhoff, Bloomfield, N. J., speaking on, "Evolution of Packaged Air Conditioning Units," and E. R. Ambrose, New York City, talking on, "The Development of the Heat Pump."

A. J. Hess, ASHVE member from Los Angeles, Calif. and president of *ASRE*, was chairman of the Tuesday morning program entitled, Panorama of Progress in Refrigeration.

The last three days of the Jubilee Technology Week were arranged as an Industrial Ventilation Conference providing current information with respect to control of dust, gas and fumes.

The anniversaries which the program commemorated are as follows:

10th: The Refrigeration Research Foundation
20th: *American Society of Mechanical Engineers* (Refrigerating and Air Conditioning Section, Process Industries Division)
50th: *American Society of Refrigerating Engineers*
60th: THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
90th: Engineering School at Columbia University
200th: Columbia University

Candidates for

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the Journal of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 62 applications for membership, including 3 reinstatements; in addition 15 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by October 31, 1954, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Arizona

Roediger, W. C., Jr., Vice Pres., Broadway Construction Co., Tucson. References: James Blake*, E. A. Lauck*, R. F. Lusk, Jr.*, E. K. Spaulding.

California

†Baracar, J. S., Sales Engr., American Air Filter Co., Inc., Los Angeles. References: W. J. Biggar, J. R. Hall, R. C. Taylor, William Tennity*.

△Lord, G. D., Engr., Hess, Greiner & Polland, Los Angeles. References: K. A. Bowman, F. B. Gardner, A. J. Hess, D. D. Wile.

McKinnon, R. J., Sales Engr., Minneapolis-Honeywell Regulator Co., Sacramento. References: F. M. Booth, E. F. Dill, S. W. Doolittle, J. E. Marshall.

Nack, D. H., Asst. Mech. Engr., Kistner, Wright & Wright, Pasadena. References: W. J. Biggar, J. R. Hall, W. O. Stewart, C. D. Walz.

Connecticut

Peck, H. L., Engr., Marchant & Minges, West Hartford. References: R. B. Cahoon, E. M. Johnson, C. Marchant*, J. D. Pierce.

Delaware

Bigelow, C. R., Sr. Service Engr., E. I. Du Pont de Nemours & Co., Inc., Wilmington. References: S. F. DesMarais, V. H. Hill, M. G. Kershaw, F. J. Weber.

District of Columbia

Reynolds, L. F., Engr., American Heating Co., Washington. References: R. E. Clark, A. A. Engelbach, A. P. Mergardt, Fred Taylor*.

△Thompson, L. C., Project Engr., U. S. Navy, Bureau of Ships, Washington. References: C. C. Carson, R. W. Collison*, A. E. DeSomma*, A. S. Gates, Jr.

Thulman, R. D., Engr., Chimney Sales Corp., Washington. References: P. R. Achenbach, R. S. Dill, James Holt, R. K. Thulman.

Florida

△Coy, R. M., Pres. & Gen. Mgr., Hill York Corp., Orlando. References: Frank Ault*, K. G. Cooper, S. L. Hamilton*, R. S. Lafferty*.

Illinois

Fuller, D. W., Pres., D. William Fuller Co., Chicago. References: C. E. Crone, J. F. Cummiskey, M. C. Lobstein, J. J. Philippi.

Gelfand, Edmund, Engr., Northern Refrigeration & Engineering Co., Evanston. References: William Goodman, Herbert Kreisman, R. E. Martin*, A. R. Wallace.

McAdams, J. R., Engr., Gustin-Bacon Mfg. Co., Evanston. References: Don Grassick*, Harry Nachman*, Harold Peterson*, L. F. Scott*.

△Pano, P. V., Sales Engr., Westinghouse Electric Corp., Chicago. References: R. W. Anderson, C. E. Fathauer*, Paul Spear*, W. E. Tracy*.

Stewart, R. W., Mech. Engr., Advance Heating & Air Conditioning, Chicago. References: H. G. Chapin, S. L. Haas, Herbert Kreisman, J. A. Oberlin.

Indiana

Yund, J. O., Chief Application Engr., Servel Inc. Evansville. References: F. A. Grossman*, H. C. Pierce, C. A. Rickner, J. M. Townsend.

Iowa

Rutgers, N. L., Branch Mgr., Minneapolis-Honeywell Regulator Co., Des Moines. References: J. R. Bain, J. E. Haines, T. R. Johnson, C. H. McGuiness.

Kentucky

Davis, W. J., Field Engr., Griffin & Co., Louisville. References: W. J. Griffin*, R. P. Quinn*, H. E. Schulze*, W. C. Wagner*.

Handmaker, A. E., Field Engr., Griffin & Co., Louisville. References: W. J. Griffin*, J. F. Kane, D. M. McMakin*, Charles Moss*.

Neel, E. W., Vice Pres., York Louisville Co., Inc., Louisville. References: Coleman Fields*, J. W. May, G. F. Spragens, H. V. Staggs*.

Spragens, G. F., Engr., York Louisville Co., Inc., Louisville. References: E. W. Neel, J. A. Renn*, L. L. Smith, Herwart Werker.

Louisiana

△Kaough, L. B., Vice Pres., City Sales & Service, Inc., Lake Charles. References: C. P. Goforth*, Robert Miller*, Clarence Oden*, Gus Quinn*.

Maryland

Mueller, R. P., Jr. Engr., Henry Adams, Inc., Baltimore. References: E. L. Crosby, H. D. Glaser, J. F. Grice, W. G. Robertson, Jr.

Massachusetts

Bird, R. P., Distr. Sales Mgr., Clarage Fan Co., Cambridge. References: S. H. Downs, G. D. Fife, C. R. McConner, R. A. Wasson.

†Glasier, R. S., Mech. Engr., Slocum & Fuller, Cons. Engrs., Boston. References: D. W. Blair, W. H. Shipp, D. J. Stressenger, R. G. Vanderweil.

Williams, Fred, Pres., Fred Williams, Inc., Boston. References: Adolph Ehrenzeller, L. R. Geissenhainer, W. R. Geissenhainer, Reid Sanders.

Michigan

Flack, Peter, Field Engr., Voorhees, Walker, Foley & Smith, Detroit. References: Thomas Economides, J. J. Kopecky, Gershon Meckler, H. M. Rudio.

△Ziel, P. H., Chief Mech. Engr., Bennett & Straight, Architects and Engineers, Dearborn. References: J. L. Best, J. S. Blossom, P. S. Hosman, L. R. Johnson.

New Jersey

Franklin, E. S., Repr., S. Franklin & Sons, Inc., Newark. References: C. R. Hutcheon, Alexander Kermes*, L. G. Miller, F. X. Morgan.

Ludwig, Gerald, Mech. Engr., Engineers Co. Inc., Newark. References: Stanley Dicker, Bernard Kaplan, Philip Schatkun, H. G. Wenig*.

Penido, D. N., Application Engr., Worthington Corp., Harrison. References: M. R. Berger, N. A. Gardner*, W. L. Schlafere*, H. J. Studivant*.

New Mexico

Danhof, G. F., Distr. Mgr., Minneapolis-Honeywell Regulator Co., Albuquerque.

Membership

References: B. H. Bridgers, R. W. Haines, J. K. James, E. F. Ross.

Farrar, I. F., Jr., Maintenance Engr., University of California, Los Alamos. References: Bill Blair, Joseph Dion, R. G. Merryman, C. R. Wherritt.

△James, J. K., Sales Engr., Boyd Engineering Co., Albuquerque. References: W. L. Jones, H. F. Munn, J. H. Van Alsburg, C. R. Wherritt.

Roper, L. C., Service Mgr., Minneapolis-Honeywell Regulator Co., Albuquerque. References: W. L. Beale, J. K. James, W. L. Jones, H. K. Pride.

Smith, J. A., Sales Repr., Crane Co., Albuquerque. References: W. L. Beale, J. K. James, H. F. Munn, H. K. Pride.

New York

△Morse, R. R., Sales Engr., C. W. Davis Supply Co., Inc., Syracuse. References: R. A. Baker, L. A. Childs, J. G. Manion, H. K. Ormsby, Jr.

Schnall, L. J., Field Repr., General Controls Co., Syracuse. References: William Lord*, Frank Lunn*, Richard Manier*, Fred Weldon*.

Spurlock, P. H., Owner, P. H. Spurlock & Co., Albany. References: J. L. Blackshaw, D. F. Lindstrom, H. A. MacEwan*, B. H. Spurlock, Jr.

Warren, A. R., Heating Engr., Oneida Supply Co., Oneida. References: L. V. Appleby, D. A. Carofano, H. F. Kruger, J. J. Springer.

Ohio

△Berger, J. A., Sales Engr., M. M. Berger & Assoc., Inc., Cleveland. References: R. L. Byers, P. B. Fleming, S. H. Givelber, W. W. Lige.

Bown, J. W., Owner, Bown & Sons, Coshocton. References: E. E. Ballard, Jr., A. D. Bogen, R. S. Curl, R. B. Thornburgh.

Brough, G. K., Chief Inspector, Bishop & Babcock Mfg. Co., Cleveland. References: J. L. Frisse, A. G. Getz*, J. J. LaSalvia, L. C. McClanahan.

Hafer, W. K., Sales Engr., Hesco Corp., Cincinnati. References: M. H. McWilliams, P. G. Pfriem, E. A. Sobolewski, R. D. Waring.

King, H. K., Sales Engr., The Bishop & Babcock Mfg. Co., Cleveland. References: J. L. Frisse, A. G. Getz*, L. C. McClanahan, A. E. Randklev*.

△MacDermid, D. W., Heating & Plumbing Contractor, Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

Shafer, D. P., Br. Mgr., General Controls Co., Columbus. References: N. L. Norman*, C. A. Reichelderfer, W. M. Surface*, R. B. Thornburgh.

Oregon

△Parsons, D. H., Heating Engr., Portland Gas & Coke Co., Portland. References: E. E. Carroll, D. F. Devine, C. P. Dougherty, A. E. Kendrick.

Phillips, W. C., Engr., Cornell, Howland, Hayes & Merryfield, Corvallis. References: O. T. Jacobsen, A. E. Lucas, R. T. Mudge, W. R. Norte.

Rosette, G. H., Sales Engr., R. E. Chase & Co., Portland. References: J. E. Finkbeiner, H. M. Hendrickson, H. L. Woolley, W. G. Woolley.

Pennsylvania

Apstein, L. I., Mech. Engr., Stewart A. Jellett Co., Philadelphia. References: J. H. Hucker, A. M. Robertson, Karl Rugart, E. K. Wagner.

Hostetler, M. J., Research Engr., The National Radiator Co., Johnstown. References: C. M. Baumgardner, G. M. Comstock, L. N. Hunter, K. O. Schlentner.

Jellett, R. T., Jr., Secy-Treas., Stewart A. Jellett Co., Philadelphia. References: H. B. Hedges, J. M. Jellett*, A. M. Robertson, E. L. Wildman.

Means, R. P., Designer, Paul P. Kopf, Cons. Engr., Philadelphia. References: W. T. Campbell, Jr.*, C. J. Forve, T. F. Kerney, P. P. Kopf.

Vacco, A. J., Owner, Kitt & Rawdon, Pittsburgh. References: J. C. Bedsole*, C. A. Lake, H. H. Leftkowitz, T. F. Rockwell.

South Carolina

†Rhett, H. W., Jr., Vice Pres., W. R. Hartin & Son, Inc., Columbia. References: A. L. Blackstone, Jr., M. R. Durlach, Jr., H. L. McDowell, V. A. Morrow.

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Texas

△Allen, Theodore, Jr., Assoc. Prof. of Mech. Engrg., Lamar State College of Technology, Beaumont. References: C. W. Crawford*, E. C. Holdredge*, L. S. O'Bannon, F. M. Tiller*.

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Roessler, C. B., Distr. Mgr., Harold O. Knape & Co., Houston. References: W. L. Fleisher, W. P. Glancy, R. E. Haubold, C. J. Trickler.

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Utah

Maycock, R. B., Mgr., Mechanical Equipment Co., Salt Lake City. References: R. C. Evans, E. V. Gritton, A. A. Maycock, D. R. Wilde.

Washington

Babcock, J. F., Owner, Plumbing, Heating & Air Conditioning Co., Spokane. References: G. M. Dieter, A. B. Hess, J. R. Morris, K. M. Wood.

Fredericks, R. S., Mech. Engr., Puget Sound Naval Shipyard, Bremerton. References: D. L. Clark, Leo Classen, C. B. Dominy, J. L. Jordan.

Jenkins, M. E., Owner, M. E. Jenkins, Engr., Spokane. References: J. E. Hutsinpiller, F. W. Jenkinson, R. D. Nevers, F. K. Steel*.

Canada

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McIntyre, D. J., Distr. Mgr., Canadian Sirocco Co., Ltd., Montreal, Que. References: T. G. Anglin, R. R. Duquette, H. G. S. Murray, R. R. Noyes.

Mitchell, C. R., Development Engr., The Anthes-Imperial Co., Ltd., St. Catherines, Ont. References: L. L. Anthes, L. N. Hunter, A. A. Marks, K. O. Schlentner.

Rockhill, H. P., Design Engr., Wiggs, Walford, Frost & Lindsay, Montreal, Que. References: D. L. Lindsay, Paul Thibault, L. C. A. Walford, G. L. Wiggs.

Sevigny, J. A., Exec. Engr., The Rankin Co., Ltd., Montreal, Que. References: F. J. Friedman, B. J. Horsburgh, W. U. Hughes, S. R. Plamondon.

Sherl, G. A., Br. Supvsr., John Inglis Co., Ltd., Montreal, Que. References: T. E. Cockman, Ernest Leblanc, H. T. O'Connor, W. J. Orr.

Takata, J. G., Asst. Dvlpt. Engr., The Anthes-Imperial Co., Ltd., St. Catharines, Ont. References: M. K. Bowman, A. A. Marks, R. J. W. Martin, E. G. Spall.

Lebanon

Abi-Rached, G. H., Instructor of Mech. Engrg., University of Beirut, Beirut. References: H. H. Fairfield*, W. I. Gaggaley, E. S. Hope*, C. K. Weidner.

Switzerland

Hurlimann, J. H., Engr., H. Hurlimann, Zurich. References: H. C. Bechtler, Herbert Brown, Max Schiesser*, Walter Sennhauser.

Rickenbach, Hugo, Owner, Rickenbach & Co., St. Gall. References: R. A. Goerg, Walter Haefner, Tibor Hegedus, Hans Huggenberger.

JOURNAL SECTION

OBITUARIES

J. HARVEY MANNY
Chicago, Ill.

The Society regrets to announce the death of J. Harvey Manny, president of Robinson Furnace Co., and a member of ASHVE since 1935. Mr. Manny died August 2, 1954 in Chicago. He is survived by his widow, Mable G., three sons, J. Harvey, Jr., Charles S., and Neil G., and two daughters, Mrs. Jean A. Halstead and Mrs. Mary E. Beckmann.

Born March 8, 1895 in Chicago, Mr. Manny attended Lewis Technical Institute there and started his career in the heating industry as an office boy in 1903 with Boynton Furnace Co. In 1916 he left the position of sales manager to join Robinson Furnace Co. in charge of the wholesale department. Three years later, in 1919, he resigned, forming his own company, Manny Heating Supply Co., of which he was president and general manager.

In 1926 Mr. Manny sold the company to Robinson Furnace Co. and rejoined them as vice president and secretary. He was president of Robinson Furnace Co. for about 12 years, until his death.

Mr. Manny was a past president of the *Western Warm Air Furnace & Supply Association*, a director of the *National Warm Air Heating and Air Conditioning Association*, and for years was a member of the original Standard Code Committee, *Western Warm Air Furnace & Supply Association.*

The Officers and Council of the Society extend their sincere sympathy to his wife and family.

REUBEN N. TRANE
La Crosse, Wis.

Reuben N. Trane, 67, founder and former chairman of the board of directors of The Trane Co., La Crosse, Wis., died September 5 after a lingering illness. He was a Life Member of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, having joined the Society in 1915.

Mr. Trane was born at La Crosse, September 13, 1886. He attended the University of Wisconsin, graduating in 1910 with a B.S. degree in mechanical engineering. While at the University he helped organize the Student Union.

Reuben N. Trane
La Crosse, Wis.

In 1913 he founded The Trane Co., heading the firm as president and chairman of the board until his retirement last year. Throughout his lifetime he maintained an active interest in education, endowing post graduate scholarships at various engineering schools. In 1951 he was cited by the University of Wisconsin in recognition of eminent professional services. He was a director and charter member of the University of Wisconsin Foundation.

Past president of the La Crosse Chamber of Commerce and a trustee of the YMCA, Mr. Trane also was a member of Pi Tau Sigma; Badger Lodge of the Masonic Order; BPO Elks and a number of other service and fraternal organizations.

The Officers and Council of the Society extend their sincere sympathy to his sons, R. J. Trane, of Scranton, and F. H. Trane, La Crosse, and his daughter, Mrs. Wayne Hood, La Crosse.

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Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

- **ARIZONA:** 1953. Hdqrs., Phoenix. Meets, First Monday. PRESIDENT, V. J. Carns, 3602 No 15th Dr. SECRETARY, A. J. Nelesen, Jr., 6744 No. 14th Pl.
- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, R. E. Blaylock, 509 E. Markham St. SECRETARY, J. L. Brown, 212 Terminal Warehouse Bldg.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. M. Lazenby, 8 11th St., N.E. SECRETARY, F. W. Bull, 1205 Spring St., N. W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, E. H. Taze, 33 E. 21st St. (18). SECRETARY, R. F. Weisman, 4650 Reisterstown Rd., (15).
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, Second Wednesday. PRESIDENT, S. C. Gale, 1628 W. 4th Ave. SECRETARY, D. A. English, 1606 W. 1st Ave. (9).
- **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, F. D. Putnam, 115 Pulsifer Dr., Auburn. SECRETARY, Merle Weninger, 230 Goodrich Ave. (5).
- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, J. A. Guy, 478 W. Fifth Ave. (1). SECRETARY, W. A. Schoonover, 2901 N. High St. (2).
- **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, F. W. Wilson, 222-24 E. 14th St. SECRETARY, R. G. Anderson, 1758 Elmore St. (23).
- **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, C. L. L'Hommedieu, 76 Blatchley Ave. SECRETARY, Walter Heywood, 14 Hartt Lane, Newington.
- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, C. V. Bankston, 2927 Jackson Ave. (25). SECRETARY, W. B. Martin, Jr., 2014 Rendon St. (15).
- **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. Meets, Second Wednesday. PRESIDENT, E. C. Doyle, 315 Washington Ave. SECRETARY, H. F. Kruger, 501 Seventh Ave., Troy.
- **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, Eric Roberts, 417 Market St. SECRETARY, F. K. Crouch, 906 Cerrito St., Albany (6).
- **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, George V. Zintel, 840 N. Michigan Ave. (11). SECRETARY, H. G. Gragg, 228 N. LaSalle St. (1).
- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, P. O. Patterson, 2701 Roosevelt Ave. SECRETARY, A. O. Roche, Jr., 3950 Broadway (5).
- **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, H. A. Bickel, E. 7 Riverside Ave. SECRETARY, Max Tonn, S. 4021 Latawah St.
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, W. E. Nanes, 220 Davidson Bldg. SECRETARY, D. E. Schroeder, 2717 Cambridge.
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, Charles Yoe, P.O. Box 2239. SECRETARY, T. L. Roberts, 2008 S. Parkwood Lane.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, F. K. Ladewig, 3527 Broadway (11). SECRETARY, R. M. Spencer, 1510 Main St. (8).
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Fourth Thursday. PRESIDENT, G. T. Christie, Midland & Notre Dame. SECRETARY, A. J. McIntyre, 935 Garwood Ave.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, G. W. Sprague, 108 Cummington St. SECRETARY, W. G. Burbo, 137 Newbury St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, A. W. Shelby, 972 Union Ave. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).
- **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT, John Schweiger, 593 Acorn Drive, (9). SECRETARY, D. E. Tullis, 743 Kiser St. (4).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, E. F. Glanz, 1761 W. Forest Ave. (8). SECRETARY, J. H. Spitzley, 1200 Fort St., W. (26).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, J. A. Craig, 814 South Ninth St. (4). SECRETARY, E. T. Erickson, 500 Baker Arcade (2).
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRESIDENT, I. E. Rowe, 120 Georgia St. SECRETARY, M. E. Price, 144 S. Congress St.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, D. L. Lindsay, 4350 Sherbrooke St. (6). SECRETARY, S. R. Plamondon, 2267 Melrose Ave. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, C. A. Goth, 3115 N. 49th Ave. SECRETARY, L. J. Paulsen, 1901 S. 39th St.
- **NEW MEXICO:** 1954. Hdqrs. Albuquerque, N.M. PRESIDENT, J. H. Van Alsburg, 1330 Cerro Gordo, Santa Fe. SECRETARY, J. K. James, 4462 Avenida del Sol.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, R. L. Stinard, 51 E. 42nd St. (17). SECRETARY, Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, H. M. Patrick, 20 Olcott Ave., Bernardsville. SECRETARY, W. C. Kruse, Jr., 40 E. Park St. (2).
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, M. W. Brown, 1213 Texas Bank Bldg. SECRETARY, H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, R. W. Winget, 2428 E. 11th St., Box 100. SECRETARY, J. T. McKinney, 1341 So. Boston.
- **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, Second Monday. PRESIDENT, D. E. Mannen, 9104 Woodland Ave. (3). SECRETARY, H. R. Canoyer, 1900 Superior Ave. (14).
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. Meets, Second or Third Friday. PRESIDENT, R. B. Crosland, Jr., 1001 S. Marshall St., Winston-Salem. SECRETARY, W. H. Cooper, 1001 S. Marshall St., Winston-Salem.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, G. E. Ervin, 2800 N. Oklahoma St. (5). SECRETARY, F. R. Denham, 320 Oklahoma Natural Bldg.
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, M. C. Bailey, 1139 Bay St. SECRETARY, H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, E. E. Kelly, 4504 S.W. Corbett Ave. (1). SECRETARY, K. N. Flocke, 3027 N.E. 31st Ave. (12).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, Third Tuesday. PRESIDENT, W. J. Robinson, 1174 Wellington St. SECRETARY, N. J. Howes, Box 264, R.R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, T. C. Caskey, 11642—26th Ave., So. (88). SECRETARY, E. W. Triol, 407 Medical Arts Bldg.
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, L. M. Church, 12 So. 12th St. (7). SECRETARY, C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, E. C. Hach, 221 Broadmoor Ave. (34). SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, V. F. Vallero, P.O. Box 5034, Terminal Annex. SECRETARY, Duane Pearsall, 1600 W. 13th Ave.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, First Wednesday. PRESIDENT, J. E. Marshall, 441 Pico Way. SECRETARY, V. W. Thornburg, 2470 27th Ave.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, G. H. Bemarkt, St. Clair Dr., R.R. 1, Caseyville, Ill. SECRETARY, W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, J. S. Malahy, Jr., 1839 Line Ave. SECRETARY, H. E. Scott, 2502 Woodford St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRESIDENT, R. F. Donovan, P.O. Box 3053. SECRETARY, J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, J. W. Holland, 245 Esperson Bldg. (2). SECRETARY, J. C. Lewis, 4101 San Jacinto St. (4).
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, C. D. Walz, 3600 San Pasqual St., Pasadena (10). SECRETARY, H. F. Ulovec, 3886 Olympiad Dr. (43).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. S. Fullerton, P.O. Box 3697. SECRETARY, J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, L. H. Hornor, Jr., 816 Insurance Bldg. SECRETARY, Boone Crisp, P.O. Box 9065, (4).
- **TOLEDO:** 1954. Hdqrs., Toledo, Ohio. PRESIDENT, F. C. Richardson, 402 Colton Bldg. SECRETARY, J. F. Guest, 1815 N. 13th St.
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, A. A. Maycock, P.O. Box 36 (10). SECRETARY, W. L. Stuewe, 1472 S. State St. (4).
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, H. E. Marquart, 111 W. Main St. SECRETARY, R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, G. C. F. Asker, 1109 W. Broad St., Falls Church, Va. SECRETARY, C. P. Humke, 5905 Berwyn Rd., Rt. 1, Box 89, College Park, Md.
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRESIDENT, L. C. McKay, 210 Sanford Bldg. SECRETARY, J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, Second Monday. PRESIDENT, F. W. Brundage, 512 N. Park St., Kalamazoo (11). SECRETARY, F. L. Murray, 482 W. Michigan Ave., Battle Creek.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, Q. P. Thompson, 260 Richmond Ave. (22). SECRETARY, G. E. Kuhn, 475 Woodland Dr., Kenmore (23).
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, L. C. Plaehn, 914 N. Broadway (2). SECRETARY, H. W. Alyea, 507 E. Michigan St. (2).

SPECIAL BRANCH

- **SWITZERLAND:** 1952. Hdqrs., Zurich. PRESIDENT: Walter Sennhauser, Sulzer Bros., Ltd., Winterthur. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Norman Falbaum, Box 4668, State College Station. SECRETARY, J. L. Flowers, Apt. 33-E, Vetville.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, C. E. Durrett, 1215 College. SECRETARY, R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. E. Bulletset, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, E. B. Katz, 415 State St. SECRETARY, R. A. Chambers, 248 Littleton.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, D. F. Carroll, Box 6264. SECRETARY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, J. R. Cairns, 4001 Florence, (21). SECRETARY, W. E. Zimmerman, 15359 Lauder (27).
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, Alexander Tudor, 75 South Dr. SECRETARY, T. M. Devine, More House, St. Michaels College.

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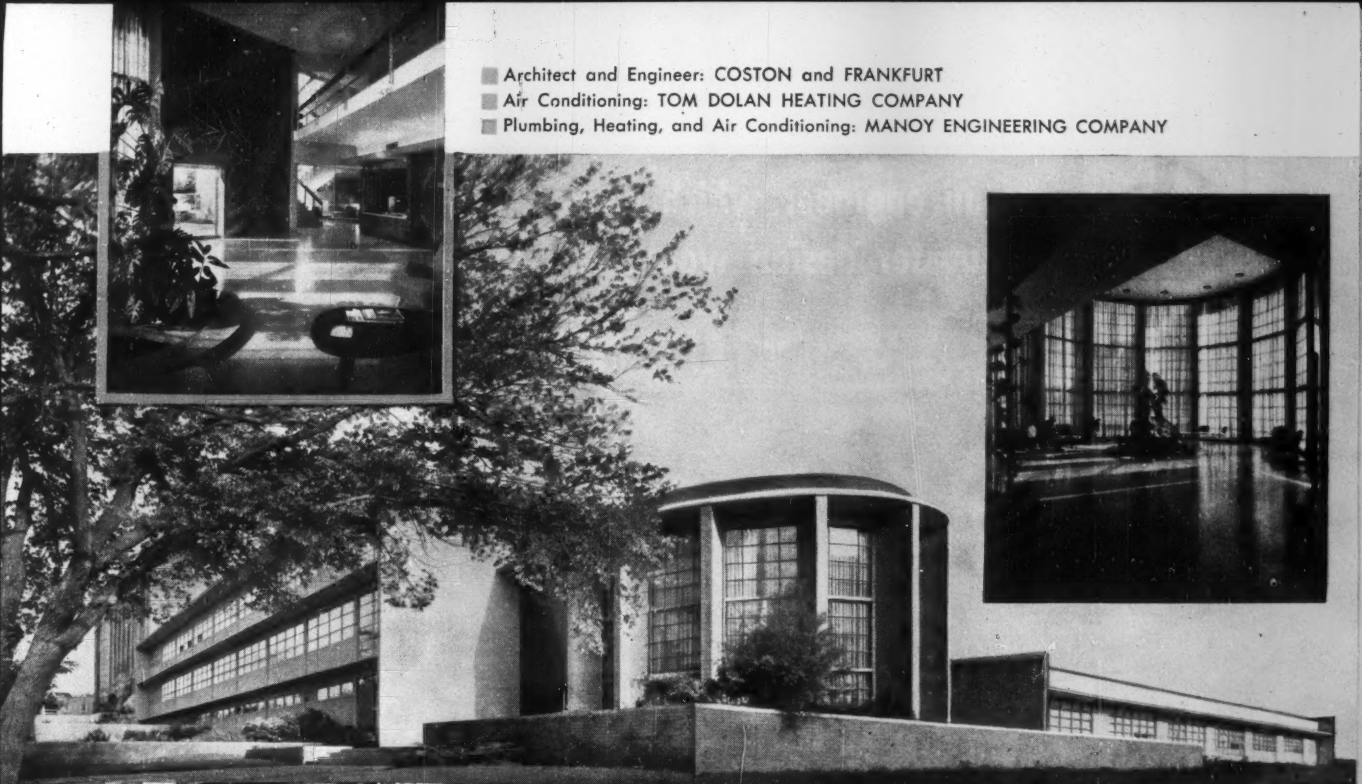
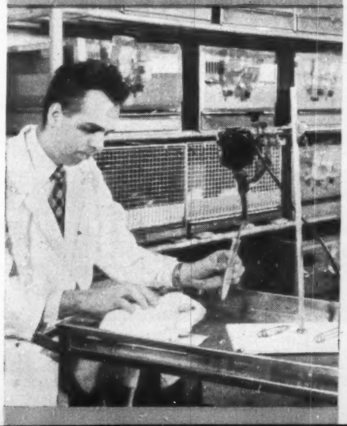


OKLAHOMA MEDICAL RESEARCH FOUNDATION BUILDING, Oklahoma City



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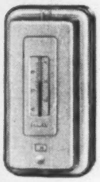

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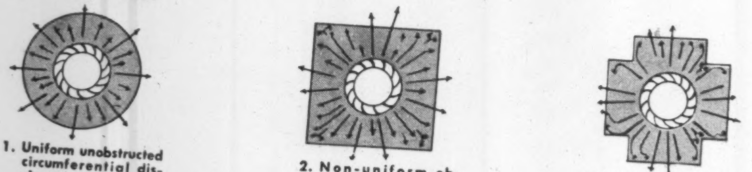
as an engineer which power roof exhauster design would you say — is **more** efficient?

Cross Sections: Discharge cones

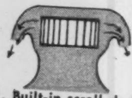


1. Uniform unobstructed circumferential discharge

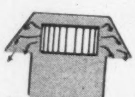
2. Non-uniform obstructed discharge

3. Non-uniform obstructed discharge

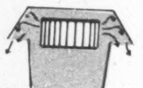
It is obvious that No. 1 because of its unobstructed discharge is more efficient. The corners of Numbers 2 and 3 create obstruction to the free flow of air and develop turbulence.



1. Built-in scroll design with ability to develop high static pressures

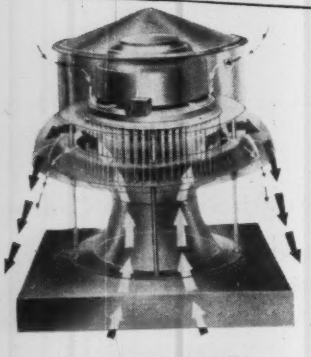


2. Little if any scroll effect and incapable of developing high static pressures

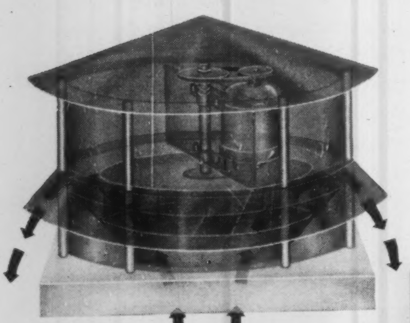


3. Similar typical design with little or no ability to develop high static pressures

The high static pressures scroll design of No. 1 is a must for efficiency. In this design a portion of the high velocity pressure at the blade exits is converted to static pressure. Other designs are merely free air machines.



Patents 2188741 2526290.
Patents pending.



Both No. 1's are features of the Gallaher Air-Van. The scroll effect design is a patented exclusive feature. It is the reason why only Gallaher power roof exhausters are able to handle almost every industrial ventilation problem that demands moving large volumes of air when high slot velocities must be maintained.

Gallaher power roof exhausters design is based on fundamental research and their true efficiency is based on actual physical tests of the entire unit, by an independent laboratory under the direction of a nationally recognized authority.

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COMPLETE LINE OF HOT WATER HEATING PUMPS

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FEATURING...

Water-tight Mechanical Seal
Pioneered by B & G, this Seal has a long record of failure-proof performance. The extremely hard material from which it is made and its method of assembly assure long, dependable service.

Oil lubricating system
Genuine protection against wear! Oil is carried up by wool wicking from a reservoir and continuously keeps the shaft and bearings in a bath of oil.

Super-finished, hardened shaft
The shaft is big—*oversized*—affording large bearing surfaces. A specially heat-treated integral collar prevents end-thrust—deadly enemy of seal and motor bearing life.

Quiet, spring-type coupler
The arms of the B & G Coupler are held together with springs—a design which dampens vibration and noise...so successfully it is used on all B & G Heating Pumps up to 25 H.P.

Special motors
Motors are either built in the B & G plant itself or to rigid specifications. B & G Boosters up to 1¼″ have smaller than usual motors—but have exactly the same capacity as previously. This motor is the first specifically designed to match the reduced size of modern boilers.

Forced hot water heating systems have expanded in application to buildings of every size and function...B & G Boosters and Universal Pumps have likewise expanded to satisfy all possible circulation requirements.

These pumps are designed and built specifically for forced hot water heating systems. In every detail, they are constructed to assure three things: First, quietness of operation...second, dependable, trouble-free performance...third, long life.

How successfully B & G Pumps achieve these goals is evidenced by the fact that more are sold than all other hot water heating pumps combined! For full information send for the B & G Catalog.

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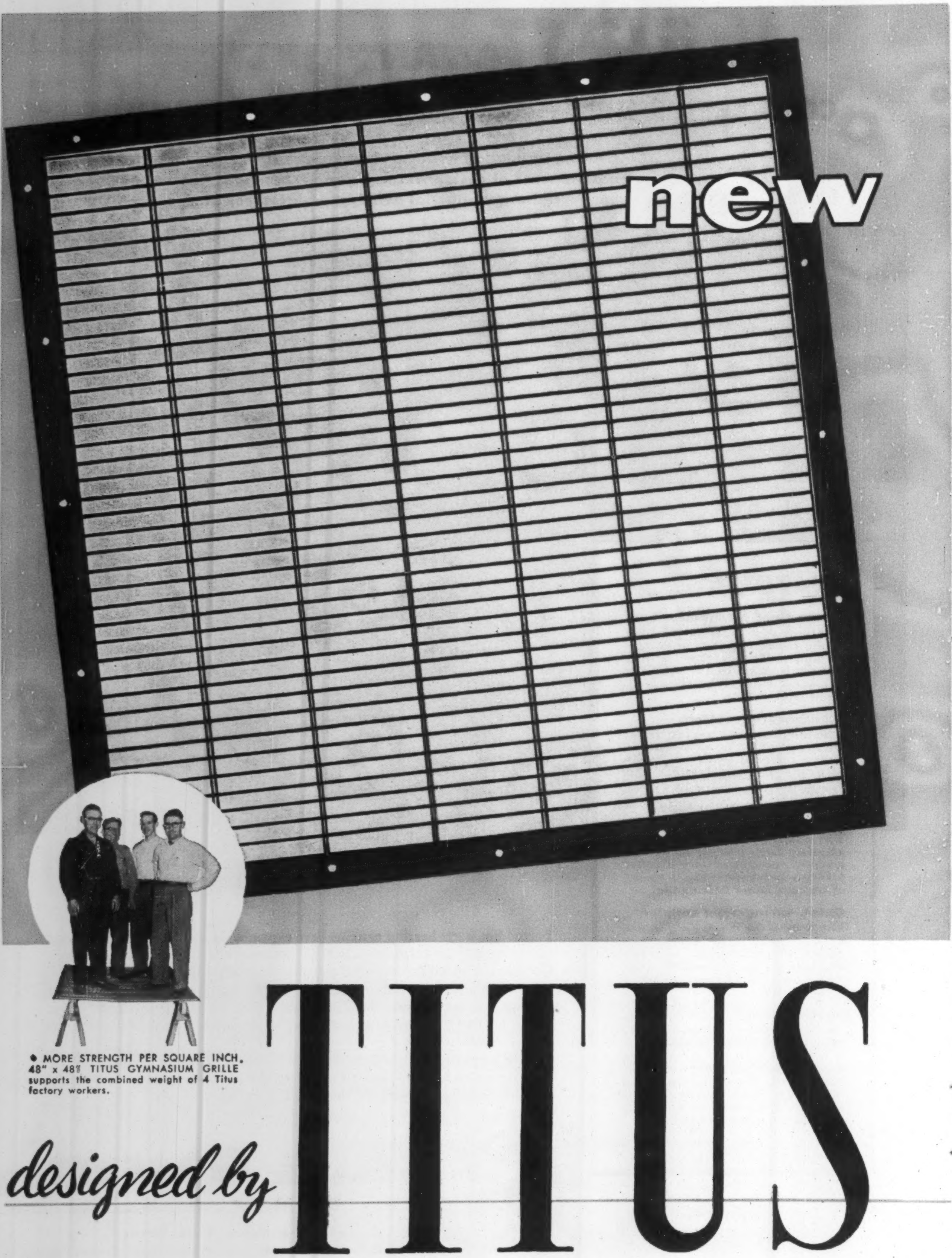

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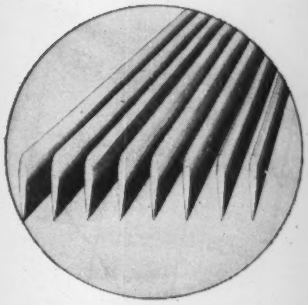
Clean cut, compact, created to blend with the lines of modern school architecture. Available as grille face only (Model G-1) or grille face with attached volume controller (Model G-2).

The Volume Controller features the famous solid section, extruded aluminum, streamlined Airfoil louvers. Noise and turbulence are cut to a minimum. At the same time, perfect, draft-free air distribution is assured.



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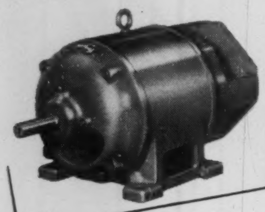

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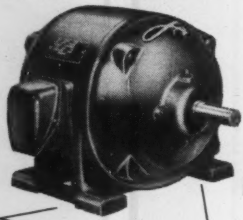

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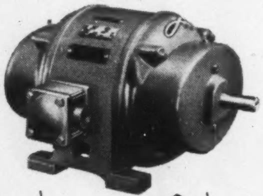

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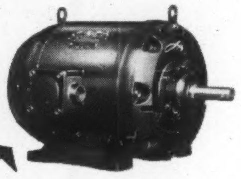

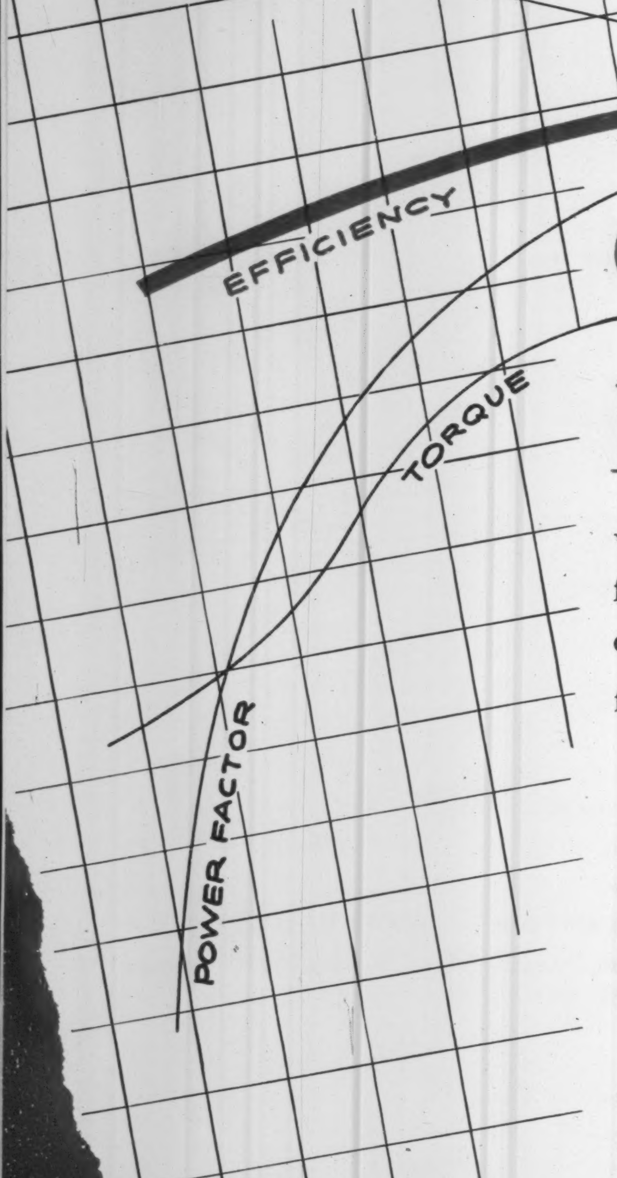

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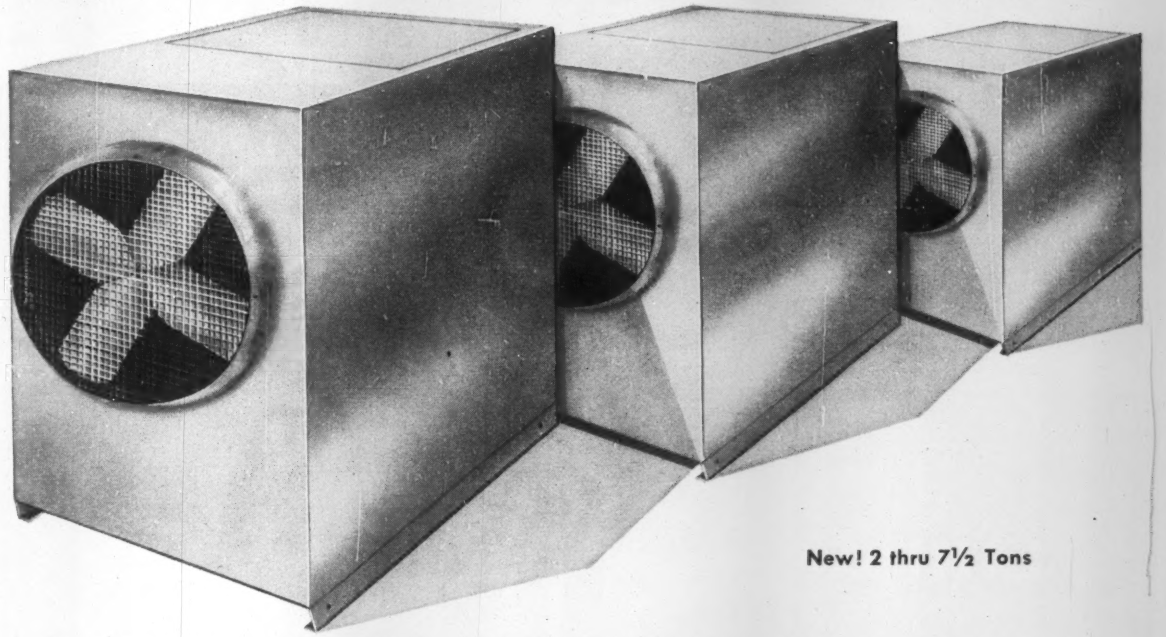
V-101

HM RESIDENTIAL COOLING TOWERS



New! 2 thru 7½ Tons

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE

PRICED FOR THE HOME MARKET

Price-wise these Halstead & Mitchell Residential Cooling Towers throw open huge segments of the home and small building market to air-conditioning. Here is the development for which the industry has been waiting. Check prices today!

NOW REQUIRED IN MANY AREAS

Residential Cooling Towers recirculate precious water . . . meet requirements of municipalities which prohibit wasting cooling water to sewers. And low cost H&M units take residential air conditioning to the suburbs and rural area . . . recirculate from a cistern if need be!

MADE FOR REAL OPERATING ECONOMY

Economical, lastworthy . . . low operating cost matches low initial cost. Efficient gravity-type distributing pan eliminates windage loss since atomizing by spray nozzle is unnecessary. Low pump head pressure is another bonus of gravity distribution. And maintenance is a snap!

FAMOUS HALSTEAD & MITCHELL QUALITY

Here's *all* the quality for which Halstead & Mitchell Cooling Towers are world famous — including the 20-year Guarantee on the wetted deck surface of pressure-treated creosoted wood, against attack by rotting or fungi growth. Stainless steel fans and shafts, plus individual cabinet coatings of Vinsynite, Vinyl Zinc and chlorinated rubber add important years of life. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service.

AT LEADING WHOLESALERS EVERYWHERE

Write for descriptive bulletin from Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers, and Cooling Towers up through 100-tons.

HM

Halstead & Mitchell

OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.

but important in *your* air conditioning plans

Here's a little circulating pump that can play an important part in home air conditioning systems. Built integrally with its own fractional horsepower motor, it delivers 20 to 30 gallons per minute at 50 p.s.i. It's comparatively new, but already this Fairbanks-Morse Fig. 5552B Builtogether Pump has achieved wide acceptance, particularly as a circulating pump in home cooling towers. There are many other applications where this dependable, top-quality pump can be of service. Why not check it for your needs. For complete information, see your local Fairbanks-Morse Branch, or write direct to Fairbanks, Morse & Co., the world's largest manufacturer of a complete pump line, 600 South Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE
a name worth remembering when you want the best

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

for Rust-Free Hot Water

look for the Copper Lining

they did at
BOSTON'S OLD HARBOR HOUSING PROJECT

Old Harbor Housing Project in Boston, Mass. p-k copper-lined water heaters were installed by the M. Ahern Company, Plumbing Contractor.

In January 1937, 31 p-k copper-lined water heaters were installed at Boston's Old Harbor Housing Project. For the past 17 years, thousands of Old Harbor residents have enjoyed the benefits of an adequate and unfailing source of rust-free hot water.

Maintenance is just routine. These copper-lined heaters need no pampering. They just keep everlastingly at it. Recent inspection showed that the copper shells are still in excellent condition and are expected to stay that way for another 20 years and more.

p-k copper-lined water heaters consist of a complete copper heater built inside of a heavy steel shell—combining the non-corrosive qualities of copper with the superior strength of steel.

For trouble-free, rust-free hot water—year after year—

LOOK FOR THE p-k Copper Lining

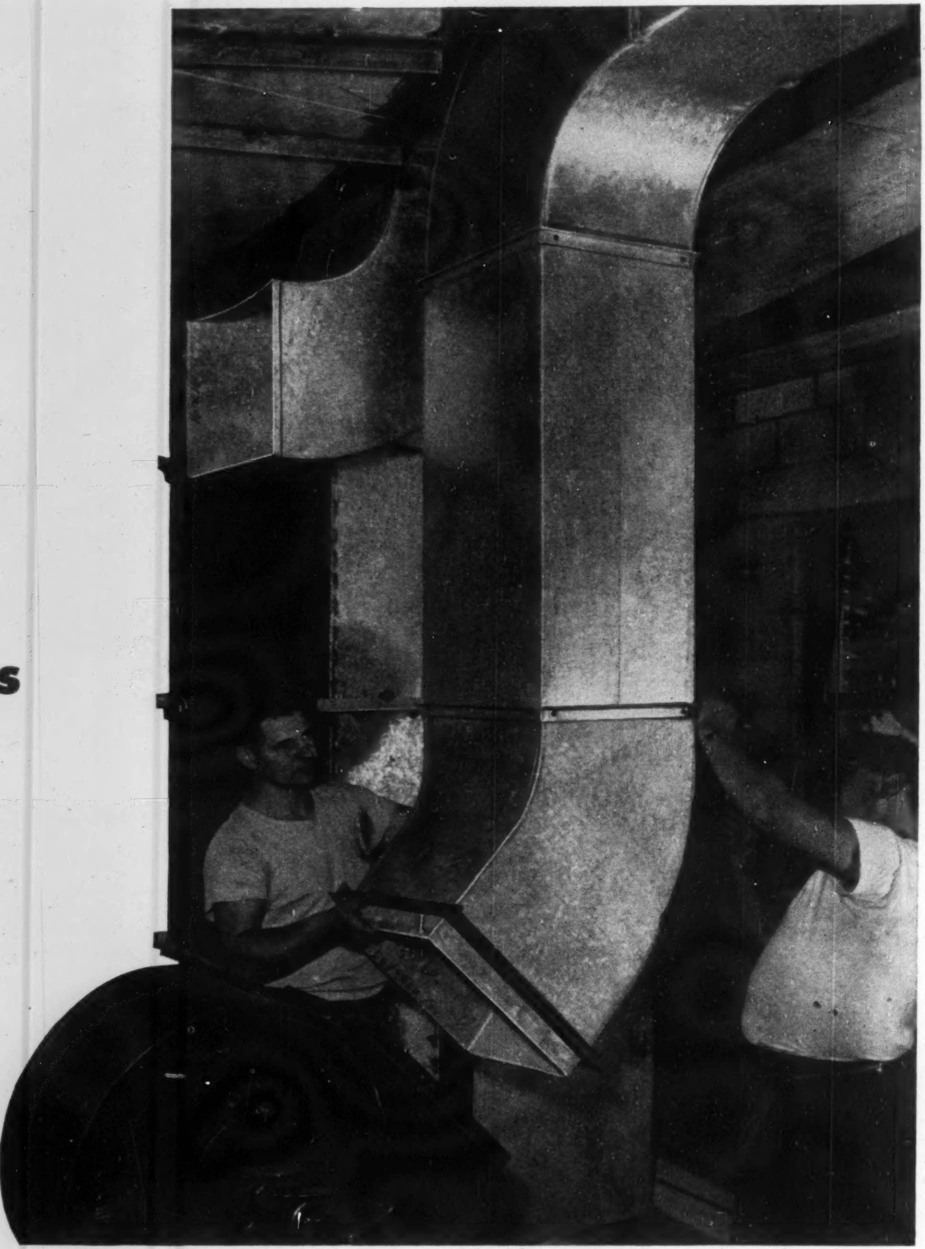
Comprehensive catalog gives you all the facts.
Write for your copy today.

the **Patterson-Kelley Co.,** inc.
800 Burson Street, East Stroudsburg, Penn.

2510

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

These Bright Spangles Attract Customers



The thousands of gleaming zinc spangles on a Bethlehem galvanized steel sheet are a powerful sales feature. The light they reflect gives this sheet a bright, clean appearance that attracts the eye.

But good appearance is only part of the story. This coating is not only attractive—it is tight, uniform, and ductile. It provides excellent protection against corrosion. And it holds securely, even after the sheet is formed or bent.

Bethlehem galvanized sheets are made from strong, durable steel, either plain or copper-bearing. They are easy to work with, and they go a long way toward helping you turn out neat, professional-looking jobs.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

***Export Distributor:* Bethlehem Steel Export Corporation**

Bethlehem
GALVANIZED
Steel Sheets

★ BETHLEHEM STEEL ★

UNISTRUT® *adjustable metal framing solves complex pipe supporting...*

Supporting piping in difficult places is easy to accomplish with adjustable UNISTRUT framing. Note the many different arrangements and angles supported. Pipe clamps, too, are part of the UNISTRUT system.

VERSATILE SYSTEM INSTALLS QUICKLY, ON THE JOB...SAVES TIME AND MONEY FOR ELI LILLY AND COMPANY

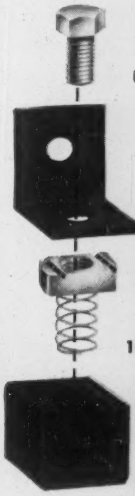
Complicated piping such as in the Eli Lilly and Company pharmaceutical plant at Indianapolis, Indiana, required supporting capable of working in difficult spots, around corners, bends...a supporting that could be put up quickly, yet economically.

UNISTRUT framing was the ideal solution. For this quick-erected system is simply cut and bolted together, custom fit to the job. No welding, drilling or skilled labor required. UNISTRUT framing reduces engineering detailing and installation time. And it is completely adjustable, permitting alterations or changes at any time.

Supporting shown here was erected from stock channel, fittings, beam clamps, pipe rollers—all part of the complete UNISTRUT framing system. This versatile framing method will save you hours and dollars on thousands of mechanical and electrical supporting jobs. See your UNISTRUT Distributor for complete details, or send the coupon for a free copy of the UNISTRUT handbook.

In this tunnel between two buildings, pipes of all sizes and types are supported on strong UNISTRUT framing. Exact slope and pitch is easily obtained because of the adjustability of this system.

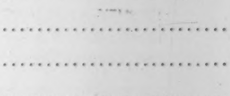
CUT AND BOLT TOGETHER



USE A HACKSAW AND WRENCH

NO DRILLING, NO WELDING

100% ADJUSTABLE AND RE-USABLE



Bring UNISTRUT to your door—
Ask to see our demonstrator car.

The World's Most Flexible All-Purpose Metal Framing

U. S. Patent Numbers
2327587 2329815 2345650
2363382 2380379 2405631
2541908 Other Patents Pending

SEE OUR CATALOG IN SWEET'S

Warehouse stocks and distributors in all principal cities. In Canada, Northern Electric Company. For Export, Pressed Steel Car Company, New York, N. Y. Consult your telephone directories.

Free Handbook!
84 pages, electrical and mechanical installations with UNISTRUT framing.

UNISTRUT PRODUCTS COMPANY, Dept. H-10
1013 W. Washington Blvd., Chicago 7, Illinois

Name..

Company..

Address..

City.................................*Zone*....*State*..............

TWENTY-FOOT LENGTHS of 10″ I.D. copper tubes receive final inspection in one of the mills of The American Brass Company. ANACONDA Seamless Drawn Copper Tubes are made up to 26″ I.D.

Anaconda Copper Tubes last longer... can actually lower your plant piping costs

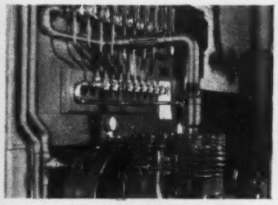
Planning a new installation? Want to replace unsatisfactory piping? Then look into the cost and performance advantages of ANACONDA Copper Tubes *first*. Many plants have found them the *least costly* piping material available.

Here's why: ANACONDA Copper Tubes are light. They come in long lengths. Smaller sizes are bent right on the job. All this means big savings on installation costs. And copper tubes can't rust. They resist corrosion and guard against contamination. Smooth interiors mean smoother flow. Pumping costs are often lower.

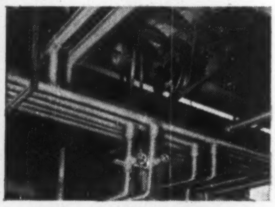
Here's another advantage. ANACONDA Copper Tubes — connected with solder-type fittings — can be taken down, moved or have new connections cut in faster than with threaded pipe. *You can meet changing plant conditions easily.*

If we can be of assistance in solving a piping problem in your plant please write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ont.* 5446

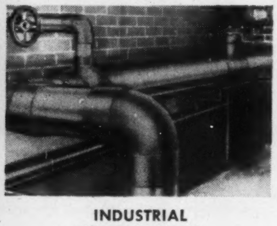
Use Anaconda Copper Tubes for:



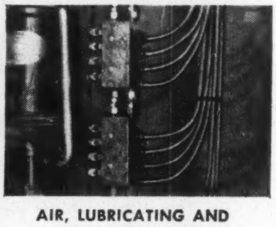
REFRIGERATION AND AIR CONDITIONING



HOT AND COLD WATER SUPPLY LINES



INDUSTRIAL HEATING LINES



AIR, LUBRICATING AND HYDRAULIC LINES

for copper piping call an

ANACONDA

Distributor

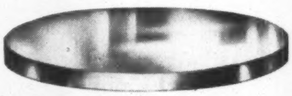
SARCO
Thermodynamic
STEAM TRAP

THERMODYNAMIC TRAP
SARCO
1/2 SARCO
OUT
IN

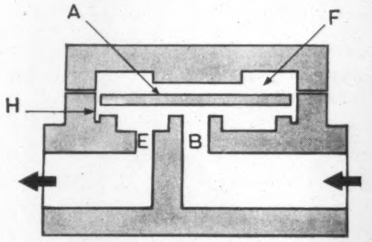
ACTUAL SIZE

this new trap virtually eliminates maintenance

SOLID STAINLESS STEEL DISC ACTS AS VALVE HEAD



HERE'S HOW IT WORKS!



Air and/or condensate raise valve seat disc A, discharge thru E. When steam follows, greater velocity causes it to strike body at H thus building up pressure in chamber F. This causes disc to seat, closing tube B. As pressure in F decreases by condensation, pressure in tube B raises disc and cycle is repeated.

The Sarco Thermodynamic Trap has proved successful on steam mains and separators; headers and soot blower pipes; engine and turbine stop valves, separators and casing drains; alternate heating and cooling applications.

2098-B

A solid stainless steel disc—practically indestructible—is the only moving part!

Most striking feature of the Sarco *Thermodynamic* Trap is its simple maintenance-free design. There's only one moving part—a solid stainless steel disc that practically lasts forever. There are no other moving parts to wear out or cause trouble.

Condensate, air and steam act directly on the disc valve which opens to discharge condensate and air—snaps shut to contain steam. There are no mechanical devices required to operate valve (see diagram at left). That means practically endless trouble-free operation.

Other advantages: small size, easy installation, not affected by shock or vibration, immunity to corrosive elements with all wearing parts stainless steel, same valve head and seat for all pressures to 600 psi and temperatures to 950° F.

Check these advantages to your own satisfaction at absolutely no cost. We'll send you a trap for trial. All you do is fill out the coupon and mail it in.

SARCO COMPANY, Inc.
Empire State Building, New York 1, N. Y.

MAIL COUPON TODAY FOR TRIAL

Sarco Company, Inc., Empire State Bldg., New York 1, N.Y.
Gentlemen: Please send me a Sarco Thermodynamic Trap for a 60-day trial, requirements as checked.
Size: ½"... ¾"... 1"... Operating Pressure:........psi
For installation on....................................
NAME____________________________
FIRM____________________________
ADDRESS__________________________
CITY________________ STATE__________

"We wanted minimum cost, maximum efficiency over a 20-year period"

—DR. W. F. WALDECK, DIRECTOR OF RESEARCH
AND DEVELOPMENT, WYANDOTTE CHEMICALS CORP.

WYANDOTTE RESEARCH LABORATORIES
Architect:
Stanton & Hillier
Consulting Engineer:
George Wagschal Associates
Heating & Air Conditioning Contractor:
Johnson Larsen & Co.

All air in new Wyandotte Research Laboratories is cleaned, conditioned, humidified, then distributed by American Blower fans.

...AMERICAN BLOWER *was specified!*

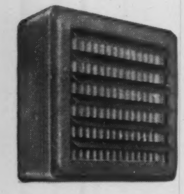
Choosing the right air handling equipment was a must in designing Wyandotte Chemicals' new multi-million dollar research building. Dr. W. F. Waldeck, Director of Research and Development, stated the objectives: "Minimum cost over a 20-year period and maximum convenience and efficiency for every phase of our research work."

After careful study, American Blower air handling equipment was specified for its dependability and quiet operation.

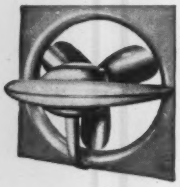
All air for Wyandotte's new research building is conditioned, washed and filtered, with each laboratory hood an integral part of the conditioning as well as ventilating systems. Each hood has an individual, two-speed exhaust fan—the chemist himself controls room and hood ventilation. Secondary air is automatically provided in each laboratory when the hood exhaust fan is turned to high speed.

American Blower engineers have a complete knowledge of the air cycle and the special problems of many industries. Let their experience work for you. Whenever you have an air handling problem, give your nearest American Blower or Canadian Sirocco Office a call.

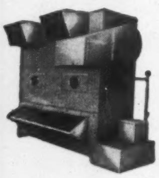
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation



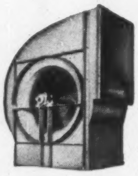
Unit Heaters



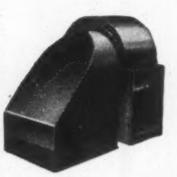
Ventura Fans



Air Conditioning Equipment



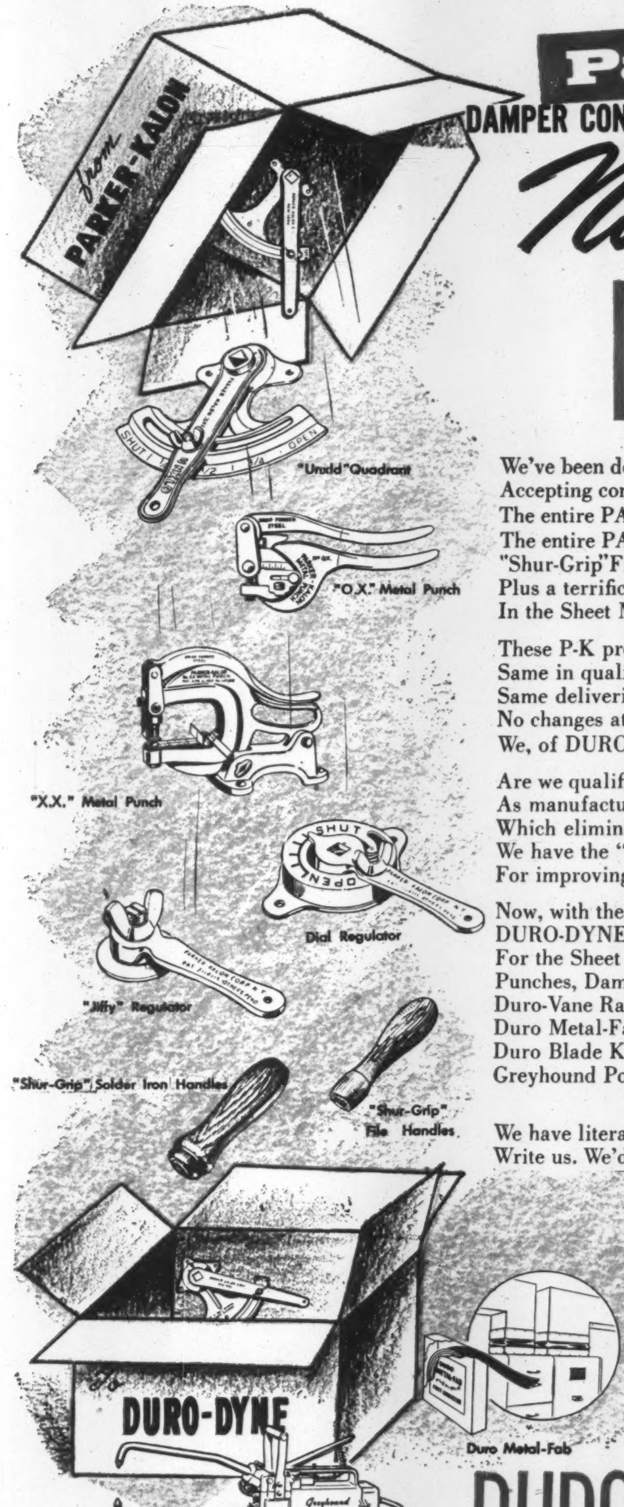
Sirocco Fans



Utility Sets

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS


from
PARKER-KALON
SHUT
1/2
1
3/4
OPEN
"Unxld" Quadrant
"O.X." Metal Punch
"X.X." Metal Punch
SHUT
OPEN
Dial Regulator
"Jiffy" Regulator
"Shur-Grip" Solder Iron Handles
"Shur-Grip" File Handles
DURO-DYNE
Greyhound
Greyhound Portable Spot Welder

Parker-Kalon

DAMPER CONTROLS, METAL PUNCHES AND FILE HANDLES

Now Made by

DURO-DYNE

We've been doing a lot of handshaking
Accepting congratulations on our big, new addition—
The entire PARKER-KALON line of "OX" and "XX" Metal Punches
The entire PARKER-KALON line of Damper Regulators and Controls
"Shur-Grip" File Handles and Solder Iron Handles
Plus a terrific team of the best distributors
In the Sheet Metal, Air Conditioning, Heating and Ventilating Fields.

These P-K products will remain the same—
Same in quality, appearance and performance—
Same deliveries—same guarantees.
No changes at all, except that
We, of DURO-DYNE, will manufacture and sell.

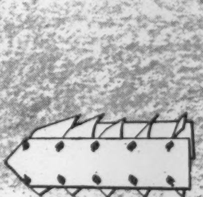
Are we qualified? You bet your life we are!
As manufacturers of revolutionary new products
Which eliminate costly steps in sheet metal fabrication,
We have the "know-how," experience and facilities
For improving and expanding our range of products.

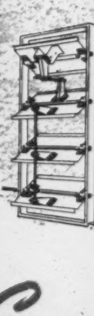
Now, with the P-K addition,
DURO-DYNE makes the most complete line of accessories
For the Sheet Metal, Air Conditioning, Heating and Ventilating Fields—
Punches, Damper Regulators, File and Solder Iron Handles—
Duro-Vane Rail for fabricating low cost, high quality air turning vanes,
Duro Metal-Fab *pre-assembled* flexible duct connector material,
Duro Blade Kit—precision engineered multi-blade damper hardware,
Greyhound Portable Spot Welder—as handy for the sheet metal worker as his snips!

We have literature and information on all these products.
Write us. We'd be happy to hear from you.

All products may be purchased through your local DURO-DYNE or P-K distributor.

Duro Metal-Fab


Duro Vane Rail


Duro Blade Kit

DURO-DYNE *Corporation*

800 D Third Avenue, New Hyde Park, N. Y.

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AGITAIR

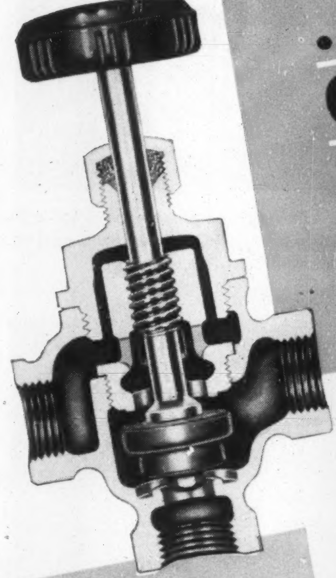
PATENTS APPLIED FOR

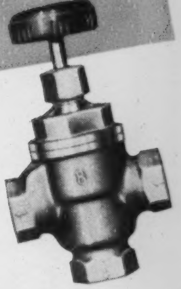
for BETTER AIR

it's ADJUSTABLE

AIR DEVICES INC., 185 MADISON AVE., NEW YORK 16, N. Y.

. . . You Provide Separate Comfort Control for Every Room with this *NEW* O-B Three-Way Valve





The O-B No. 4600 valve is especially designed for forced circulation heating or cooling systems using remote units.

With its parallel double-seat construction, the No. 4600 can be used to control flow in three ways:

1 The entire water flow can pass through the unit.
2 Any predetermined portion can flow through the unit and the rest will be by-passed to return piping.
3 All the water can be made to bypass the unit.

The occupants of any room can thus control temperature to their liking without affecting the rest of the system in any way.

Regardless of the position of the valve, the total quantity of water pumped through the system does not change. This means a constant pump delivery so that the danger of overloading is practically eliminated.

No. 4600 valve is available in ⅜ and ½-inch sizes. Additional information on this new valve is contained in Bulletin 1319-V. For your free copy, mail the coupon below.

Check

THESE OUTSTANDING FEATURES

1 Individual control of room units.
2 Helps prevent overloading of pump motors.
3 Composition discs are renewable without removing the valve from the line.
4 Full flow, partial flow or complete by-passing of unit.
5 Maximum water working pressure 300 pounds and maximum operating temperature 425° F.

Ohio Brass

MANSFIELD OB OHIO, U.S.A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4464-V

Ohio Brass Company
380 N. Main Street
Mansfield, Ohio

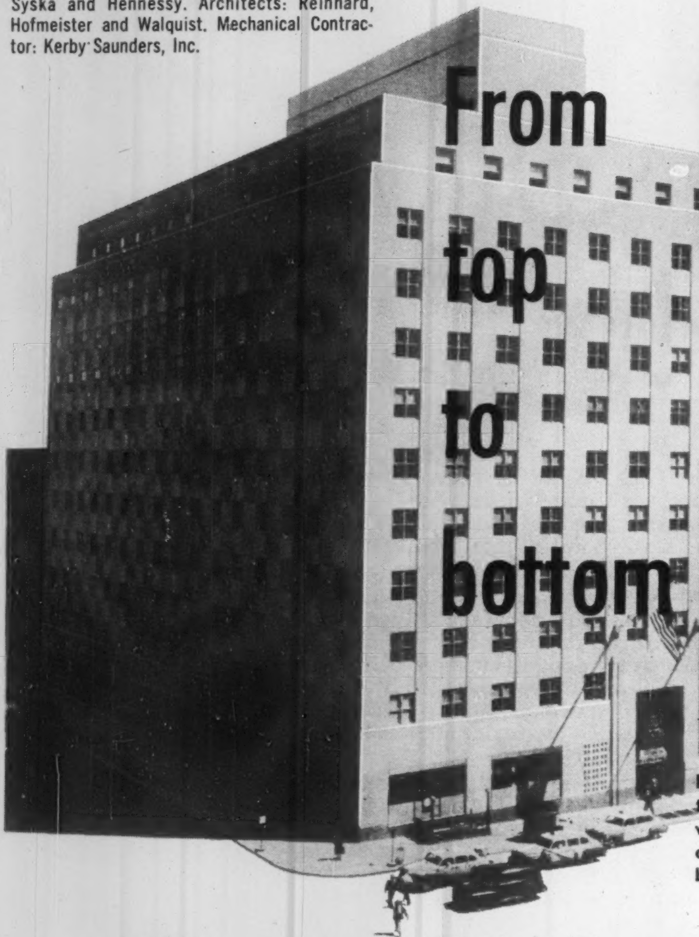
Please send me my copy of Bulletin 1319-V describing the new O-B Three-Way Valve.

Name ____________________

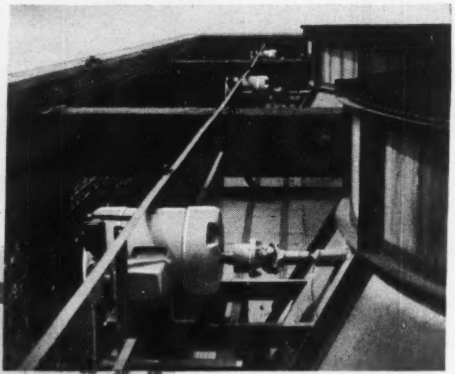
Company ____________________

Address ____________________

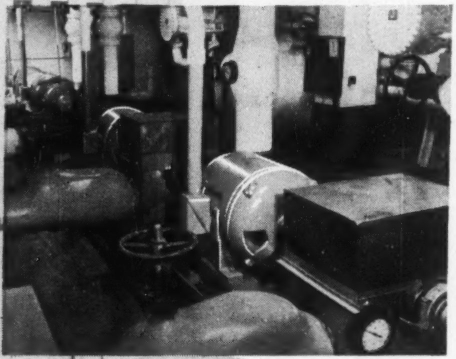
Below; The Dun & Bradstreet Building—located at 99 Church St., New York City. Owner: Dun & Bradstreet, Inc. Builder and General Contractor: George A. Fuller Co. Consulting Engineers: Syska and Hennessy. Architects: Reinhard, Hofmeister and Walquist. Mechanical Contractor: Kerby Saunders, Inc.



From top to bottom



Three 20-hp, 1760-rpm Squirrel-cage Splash-proof motors driving cooling tower fans on the roof of the Dun & Bradstreet building.



Four 100-hp, 1750-rpm Squirrel-cage protected-type motors driving two 1400-gpm condenser water pumps (foreground) and two 1750-gpm chill water pumps (rear). These are in the second basement of the Dun & Bradstreet building.

this air conditioning system uses...

ELLIOTT CROCKER-WHEELER MOTORS

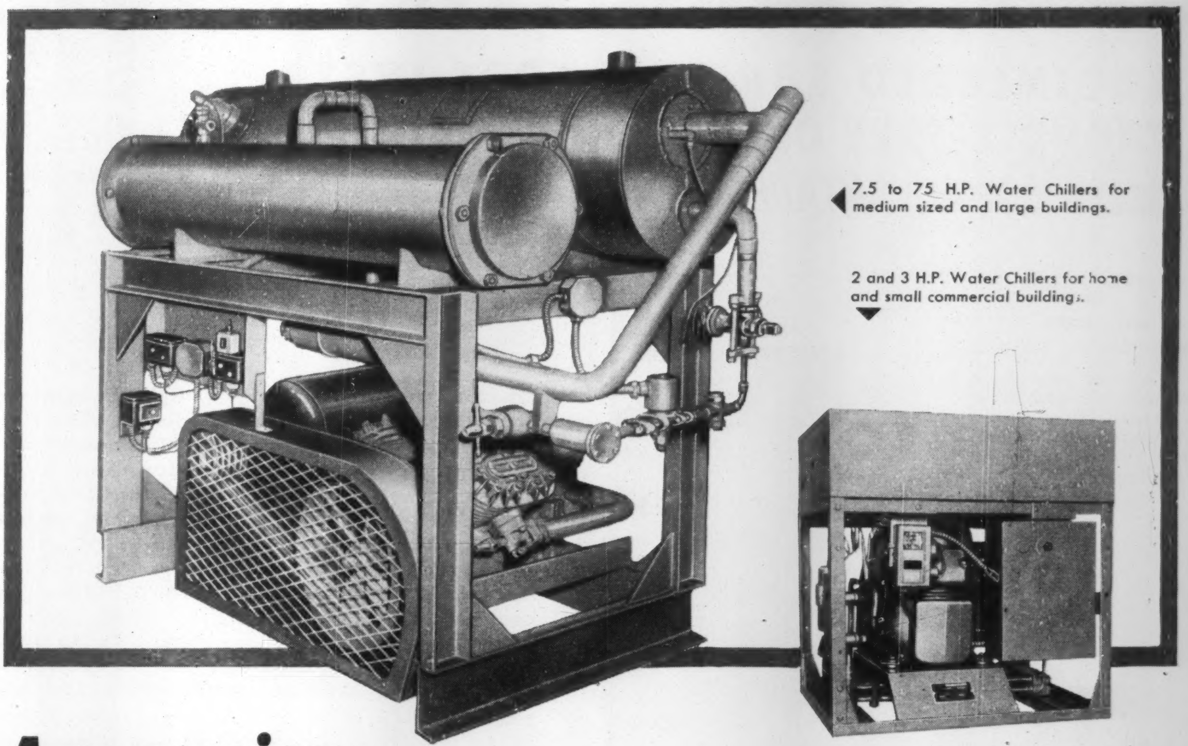
Wherever the wheels of business turn, Dun & Bradstreet, Inc., is on the job. This new office building at 99 Church Street, New York City, serves as both their National and New York District Headquarters. The modern, completely air conditioned building assures pleasant, comfortable working conditions for approximately two thousand Dun & Bradstreet employees.

The components of this air conditioning system utilize approximately 60 Elliott Crocker-Wheeler motors of various horsepower ratings. They drive intake fans, exhaust fans, condenser water pumps, and window unit pumps. Your local Elliott representative is ready to acquaint you with the merits of Elliott Crocker-Wheeler motor applications in air conditioning systems; or write Elliott Company, Crocker-Wheeler Division, Ampere, New Jersey.

ELLIOTT Company

W4-5

TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS



◀ 7.5 to 75 H.P. Water Chillers for medium sized and large buildings.

2 and 3 H.P. Water Chillers for home and small commercial buildings. ▼

Announcing

new American-Standard Water Chillers that you can install in half-an-hour

New American-Standard Water Chillers come factory assembled with circuits completely piped, wired and tested. Just make a few simple electrical and plumbing connections and the chiller is installed.

There are two basic American-Standard chiller packages ranging from 2 to 75 H.P. One, for use in homes or small commercial buildings, is available in 2 and 3 H.P. sizes. Large chillers, for medium and large buildings, range in size from 7.5 to 75 H.P. All American-Standard Water Chillers come mounted in a rigid steel frame for easy handling.

The 2 and 3 H.P. water chillers have a hermetically-sealed motor and compressor assembly. You can get a 20-gauge steel jacket for the chiller, too. It comes in a handsome Forge Red color, and has a removable front cover.

Big American-Standard Chillers have low-speed compressors for extra quiet operation.

These new chillers are just the thing for a cold water source for all air conditioning systems. For more information about the new packaged water chillers or the complete Remotaire System, fill out and return the attached coupon to the **American Radiator & Standard Sanitary Corporation**, Pittsburgh 30, Pennsylvania.

American-Standard
Dept. HP-104, Pittsburgh 30, Pa.

Please send me literature on:

☐ 2 and 3 H.P. American-Standard Water Chillers
☐ 7.5 to 75 H.P. American-Standard Water Chillers
☐ the complete Remotaire Heating and Cooling System

Name...
Address..
City.......................... State.............

American-Standard Products

AMERICAN-Standard
WATER HEATING-COOLING SYSTEMS

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

SAFE, CLEAN COAL HEAT...

ENGINEERED FOR LOW COST INSTALLATION... TROUBLE-FREE OPERATION & MAINTENANCE—*OBTAIN ALL THESE ADVANTAGES WITH A* WILL-BURT

STOKER

WILL-BURT HOPPER MODEL STOKER

available in both open and closed models. Capacity of closed models: 20 to 125 lbs. per hour. Capacity of open models: 150, and up to 750 lbs. per hour.

WILL-BURT AUTOMATIC AIR CONTROL

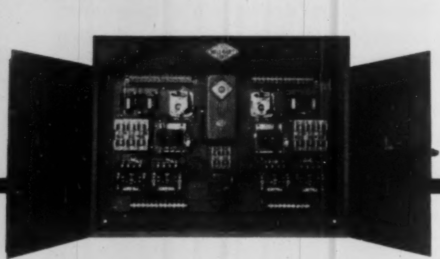
assures the proper combustion of fuel during the operating period as well as during the time the blower and feed screw are off. This patented device prevents a condition of smoke and soot. It allows for dissipation of any intense heat that may be surrounding the tuyeres or dead plate by permitting induction of normal draft to the fire bed. It automatically assures the most efficient combustion of bituminous coal in ever-changing fuel bed conditions.

Coal fired with a Will-Burt Stoker is the preferred method of heating wherever low-cost installation, clean coal heat and a factor of greater safety are of utmost importance. Will-Burt Stokers are engineered for application to a variety of coal burning boilers and furnaces, providing trouble-free performance, particularly where installations in schools, hospitals, churches, institutions, apartments and factory buildings require relief from maintenance throughout the heating seasons. The Will-Burt patented automatic air control delivers the correct quantities of air for complete efficient combustion during the operating and off periods—providing low-cost, clean coal heat. Prevention of smoke and soot, such as is usually prevalent when the fire is starved for air, is practically eliminated by air automatically induced to meet ever-changing fuel bed conditions.

Automatic and efficient controlled heating, as well as a factor of greater safety, is assured with Will-Burt Stoker safety devices and control panel—available in a standard unit ready to install and operate. Safety shear pin and disconnect switch are provided on all model stokers and are designed to be reset easily without any special tools. A bell or light signal can be installed to indicate a sheared pin.

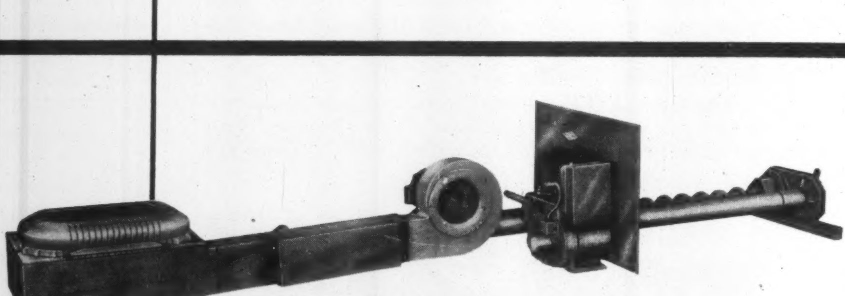
"Coal fired with a Will-Burt Stoker" is low-cost heat.

Write for Engineers' Reference Manual which includes general stoker data and suggested specifications for stokers; also installation diagrams for Will-Burt hopper and bin fed stokers and Will-Burt control panels.



WILL-BURT CONTROL PANEL

provides the proper combination of disconnect, selector and time switches, holds fire controls and shear pin alarms, wired and factory tested. Combined with operating, limit and low-water controls, and shear pin switches, these controls provide the additional factor of safety preferred in heating systems in schools, hospitals, churches, institutions, etc.



WILL-BURT BIN FEED STOKERS

reduce cost of coal handling and maintenance to an all-time low. For application with various types of bituminous coal burning boilers and furnaces.

The **WILL-BURT** *Company*

OVER TWENTY-FIVE YEARS IN THE STOKER BUSINESS

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Copper

The Proved metal for roofing and construction

Hussey Copper Roofing
•
Hussey Copper Flashing
•
Hussey Copper Roof Drainage Products and Builders' Specialties

Install with confidence!
—its history proves its durability

Costs less because it serves longest!

Fabricates with ease!

Solders and Brazes!

Reserve for copper the jobs that copper has always done best. No other metal has the century-old history of durability and complete dependability under the most severe weathering conditions. Only copper has the extreme flexibility that permits easiest and most perfect fabrication on or off the job site. There are "best" materials for everything—for roofing, drainage work and weather-proofing it's HUSSEY COPPER.

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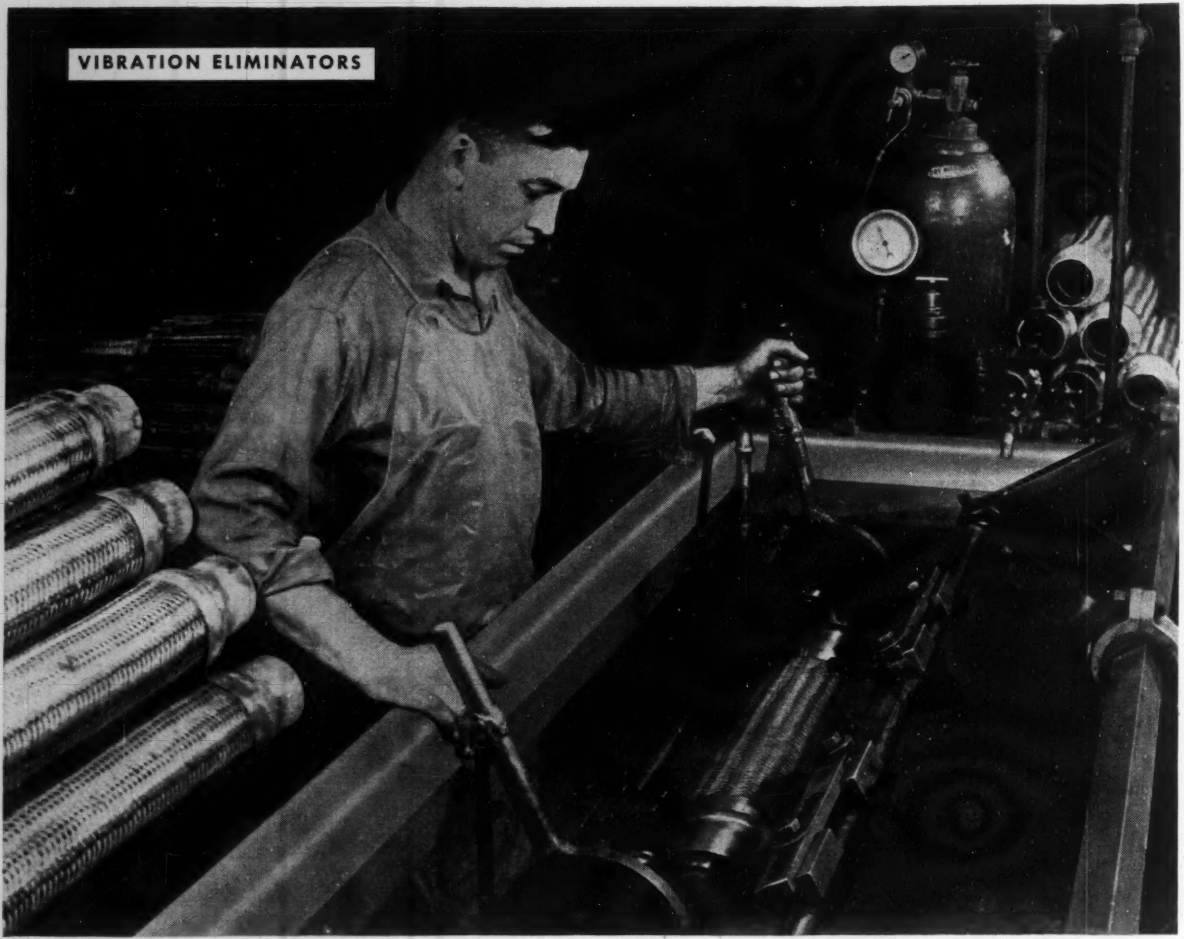
HUSSEY
BRASS

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
ROLLING MILLS AND GENERAL OFFICES
PITTSBURGH 19, PA.

7 WAREHOUSES Pittsburgh, Cleveland, St. Louis, Philadelphia, New York, Chicago, Cincinnati

VIBRATION ELIMINATORS



Because freedom from leaks in refrigerant lines is so important . . .

Nitrogen–under pressure–searches for leaks in every American Vibration Eliminator

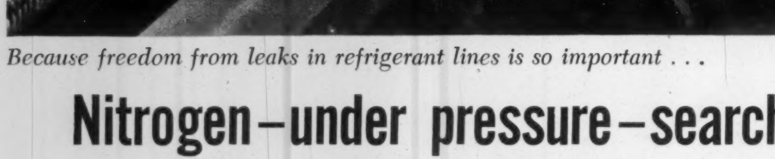
When you install an American Vibration Eliminator, it's leakproof and permanent. Here is why.

We test each Eliminator in tanks such as the one shown above–under pressure and under liquid at the same time. Searching nitrogen–under pressure–shows up the tiniest leak. When the unit is found *absolutely* free of leaks, then–and only then–we dry the Eliminator in a special oven and prepare it for shipment. Ends, of course, are sealed to keep the unit clean.

American Vibration Eliminators have *seamless* cores. They have no laps or joints where leaks can occur. High grade phosphor bronze (98¾% copper, 1¼% tin) makes this core more resistant to fatigue. Bronze wire is woven over the flexible core to give added strength for pressure duties.

To prevent cracked piping, isolate noise and vibration, use quality American Vibration Eliminators.

They are stocked in standard copper tube sizes by leading wholesalers. For descriptive Bulletin VE-310R write: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.* 54228

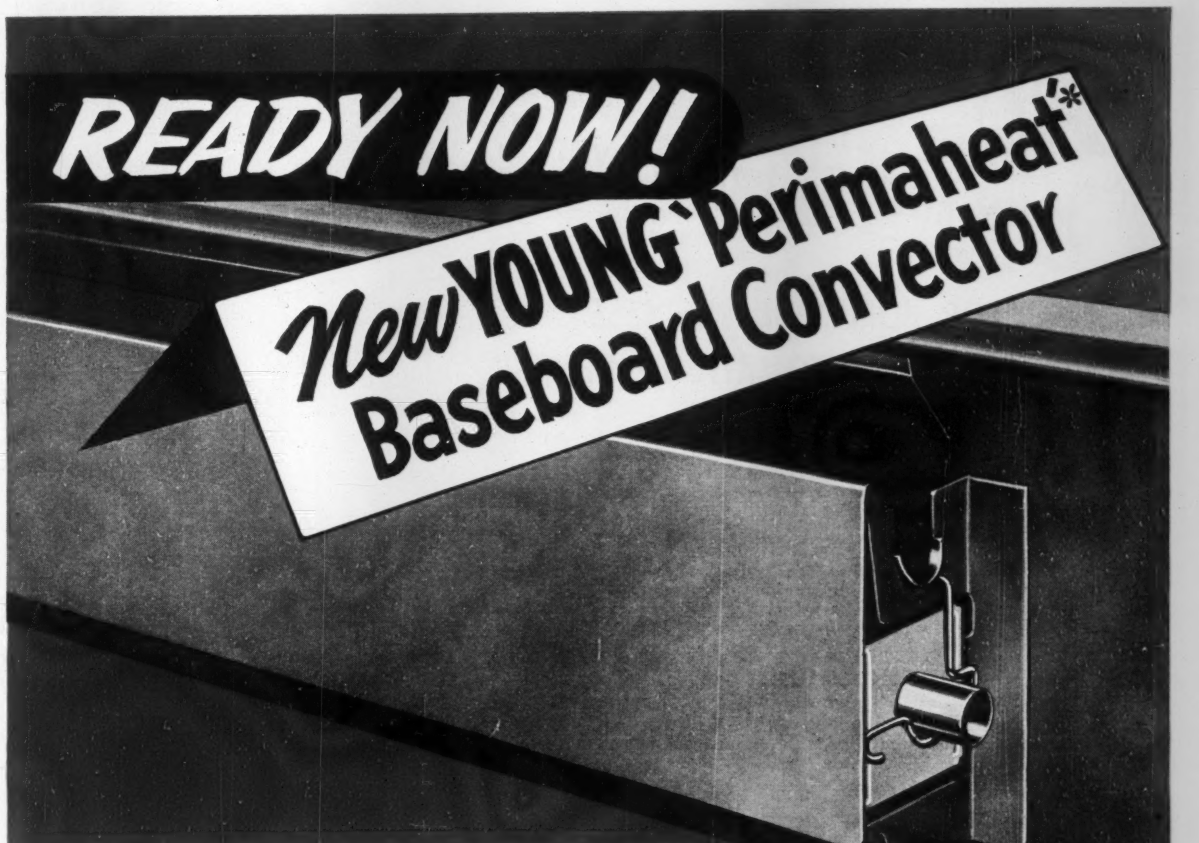


WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

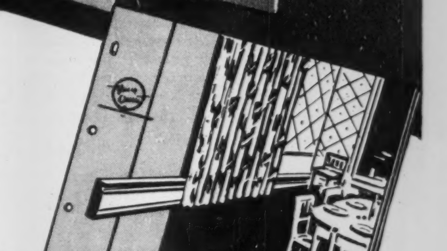
an **ANACONDA**® product



New YOUNG "Perimaheat" offers low cost . . . highly efficient hot water heating for every type of construction. It is the ultimate in modern heating design with many time and money saving features. Packaged in 6 and 8 ft. lengths, "Perimaheat" is light in weight, easy to handle, and easy to install.

Add new beauty, plus more usable wall space to your building projects with this *New* quality baseboard convector line. Use this convenient coupon to send for your free YOUNG "Perimaheat" Catalog, today!

*Trade Mark



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Heating, Cooling, Air Conditioning Products for Home and Industry

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JOHN ZINK Heaters for Every Use

FOR HOME AND BUSINESS
SPECIFY SAFE, AUTOMATIC J-Z HEATERS

There are four styles of J-Z Heaters to meet every domestic and industrial heating requirement. J-Z Heaters provide many advanced engineering features that assure safe, economical operation and maximum heat output. Whether bought for home or commercial use, J-Z Heaters and Burners are AGA approved for natural, mixed or LP Gas.

FLOOR FURNACES

J-Z Gas Fired FLOOR FURNACES are available in five conventional and short models with input ratings from 30,000 B.T.U./hr. They become a complete one-package heating unit when equipped with safety pilot and automatic temperature control. Small grille, high heat transfer.

SUSPENDED UNIT HEATERS

Series UHS Fan Type UNIT HEATERS are fully automatic and provide clean, safe and trouble free forced air heating. Heaters are for all gases and are equipped with positive automatic safety shut-off valves. Have B.T.U./hr. rating from 55,000.

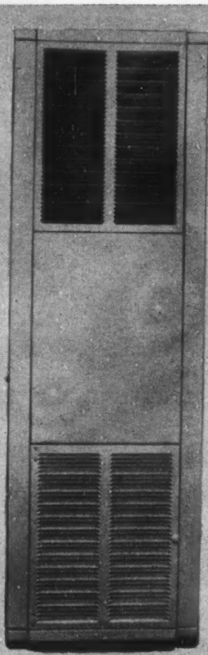
CENTRAL GAS HEATERS

J-Z CENTRAL HEATING UNITS are compactly built, simple, efficient in operation and are available in Vertical or Horizontal type forced air models. Heaters can be installed in the basement, attic, service closet or utility room. The AF-110 may even be installed under the house if provisions are made for the draft diverter. For industrial applications, J-Z Central Heating Units can be installed on a shelf or balcony, as a suspended heater or as a duct heater. B.T.U./hr. ratings from 65,000.

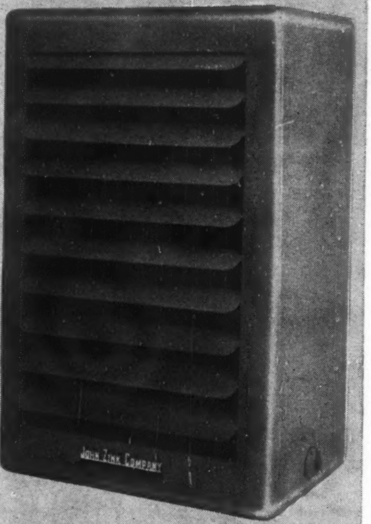
WALL HEATERS

WH-25 Recessed Wall Heater fits between partitions on 16" stud centers. Barely 58" high. Available in standard or radiant styles. 25,000 B.T.U./hr. rating.

JOHN ZINK COMPANY
4401 SOUTH PEORIA • TULSA, OKLAHOMA



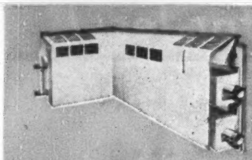
WALL HEATER

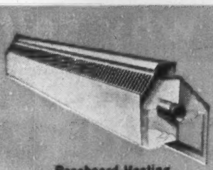


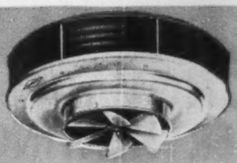
SUSPENDED UNIT HEATER

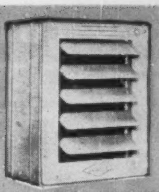
FLOOR FURNACE

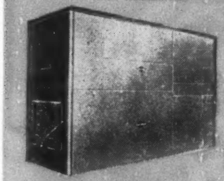
CENTRAL GAS HEATER

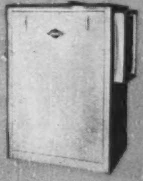

Wall Radiation

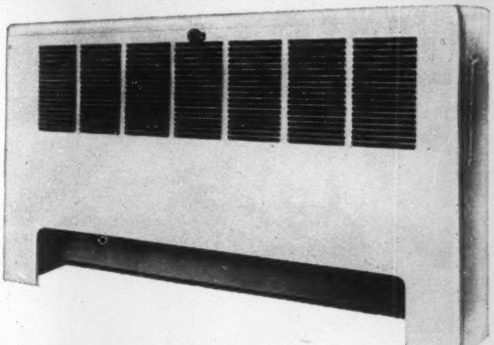

Baseboard Heating


Down Blow Unit Heaters


Horizontal Unit Heaters

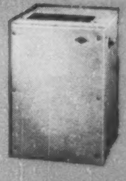

Model AEC Air Conditioners
with self-contained water saver


Furnace Air Conditioners


UNARCO Convector-Radiator

- Snap-on front panel • easy-to-clean • Knock-out end panels for easy installation • Cast bronze headers for added heat transmission
- 18-gauge steel front and top • Directional die-formed louvers
- Simple damper control • Carefully rounded corners for safety
- Attractive modern design
- Ideal for homes, offices, institutions, industrial and commercial uses

Highboy Air Conditioners


Mobile Air Conditioners

year 'round weather conditioning*

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World's finest heating and cooling products in a complete range of types and sizes

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Gentlemen:
Without obligation, please send illustrated literature on the following units:

☐ Convector-Radiators
☐ Baseboard Heating
☐ Wall Radiation
☐ Horizontal Unit Heaters
☐ Down Blow Unit Heaters
☐ Highboy Air Conditioners
☐ Furnace Air Conditioners
☐ Mobile Air Conditioners
☐ Model AEC Air Conditioners with self-contained water saver

Please have representative call ☐

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They cost no more . . . So why settle for less!

THE BEST AUTOMATIC AIR VALVES FOR EVERY HOT WATER HEATING JOB ARE LABELED . . .

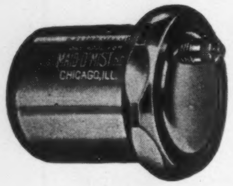
MAID-O'-MIST AUTO-VENT®

NUMBER 7 AUTO-VENT

For mains, pipe lines, unit heaters, convectors, panels, coils, etc. A favorite . . . proved dependable on hundreds of thousands of installations.

- Self-closing, float-controlled valve
- Non-ferrous metals
- No air chamber required
- Designed for pressures up to 75 lbs.

For vertical mounting only. Size 4⅜" x 2¼" with ⅛" I.P. female connection.



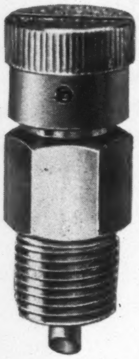
NUMBER 27 AUTO-VENT

For convectors and for space limitations.

- Dependable float-operated valve
- Non-ferrous metals
- No air chamber required
- For pressures up to 50 lbs.

For horizontal mounting only. Size 3" x 2¼" with ⅛" I.P. female side connection.

NUMBER 72 AUTO-VENT



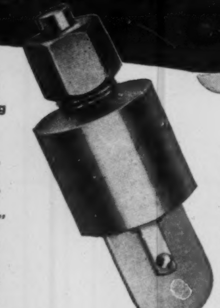
For convectors, baseboard and free-standing radiation. The fastest venting valve (expansion type) on the market!

- Expansion and contraction confined to 4 vent slots only
- Special composition control disc
- Internal siphon tube
- No air chamber required

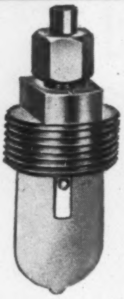
For vertical or horizontal mounting. Size 1¼" x ½" with ⅛" I.P. male connection.

MAID-O'-MIST BALANCING VALVE ADAPTER UNITS

MAKE ANY COPPER, BRONZE OR CAST IRON TEE A BALANCING VALVE!



No. 14 Balancing Valve Adapter Unit for ⅜", ½" ¾", 1" nominal copper tees.



No. 15 Balancing Valve Adapter Unit for ½", ¾", 1", 1¼", cast iron tees.

Any stock tee, plus the Adapter Unit completes a balancing fitting for hot water heating systems. These new units, quickly soldered or sweat-fitted into copper and bronze tees or threaded into cast iron tees, regulate the flow of hot water through radiators, convectors, baseboard panels, radiant coils, return mains and branches. Precision made of non-ferrous metals.

Full free flow through the tee. No restriction except for the balancing required.

NUMBER 67 AUTO-VENT

For convector and baseboard radiation

- Self-closing, float-operated
- Compact size
- Non-ferrous metals
- No air chamber required
- For pressures up to 30 lbs.

For vertical mounting only. Size 3-3/16" x 1½" with ⅛" I.P. male connection.

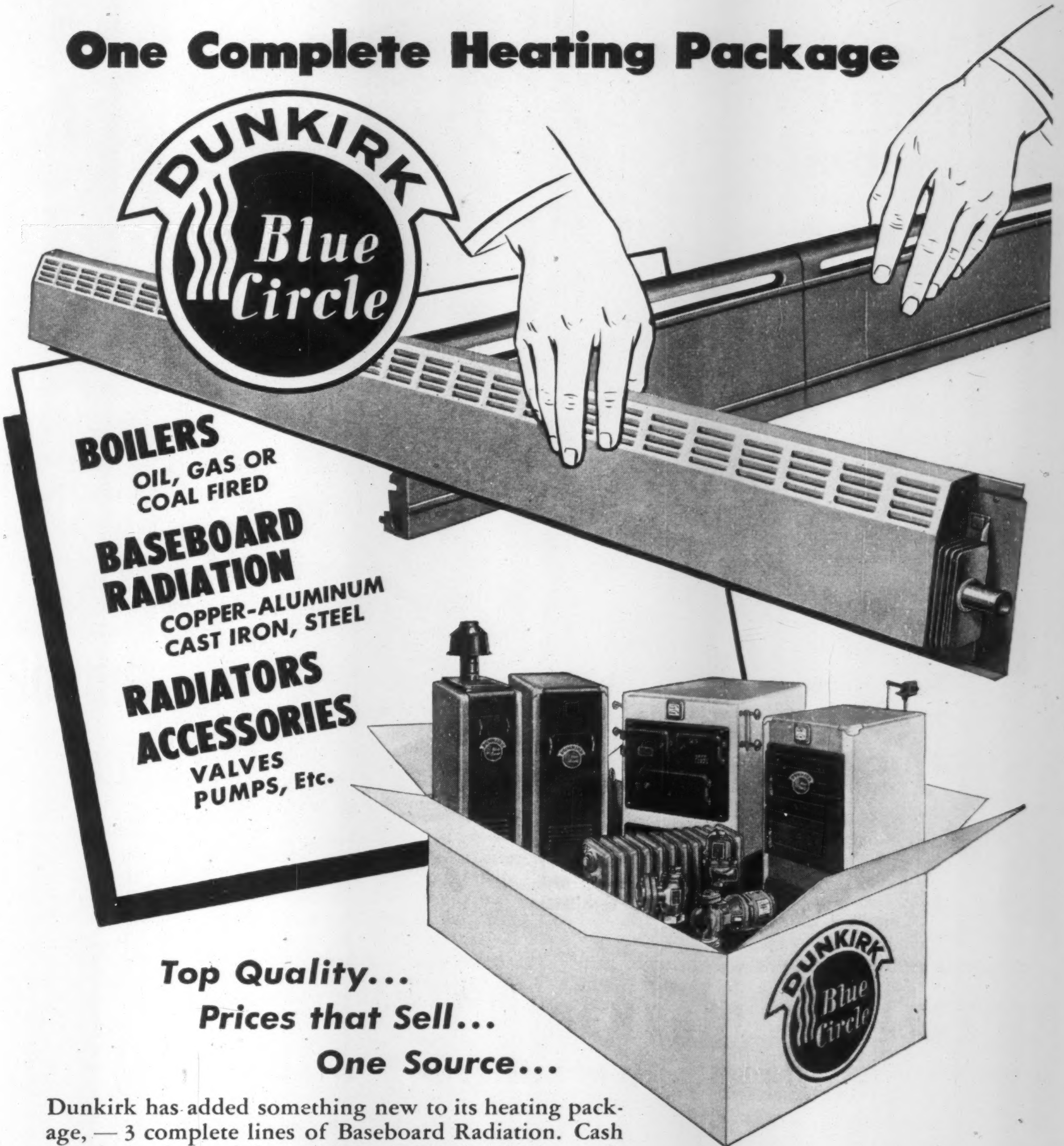
MAID-O'-MIST Inc.
HEATING SPECIALTIES

AUTOMATIC HUMIDIFIERS . . . . . AUTO-VENTS
WATER LINE CONTROLS . HEATING SPECIALTIES

MAID-O'-MIST, Inc.

3217 NORTH PULASKI ROAD . CHICAGO 41, ILL.

One Complete Heating Package


DUNKIRK
Blue Circle
BOILERS
OIL, GAS OR COAL FIRED
BASEBOARD RADIATION
COPPER-ALUMINUM CAST IRON, STEEL
RADIATORS
ACCESSORIES
VALVES PUMPS, Etc.
DUNKIRK
Blue Circle

Top Quality...
Prices that Sell...
One Source...

Dunkirk has added something new to its heating package, — 3 complete lines of Baseboard Radiation. Cash in on the demand for uniform, ankle height, around-the-room, low cost steam or hot water heat. Take advantage of the Dunkirk complete Blue Circle line, designed right, built right, priced right. Boilers and Radiation for residential and non-residential use, specially designed for fuel economy.

Write for your Dunkirk Profit Story ➡

DUNKIRK RADIATOR CORPORATION
DUNKIRK, NEW YORK

Send New Baseboard Catalog.

Name ....
Concern ....
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City.............................*State*..........

DUNKIRK RADIATOR CORPORATION • DUNKIRK, N. Y.

SEND FOR THIS BULLETIN 400 TODAY!

Electro-Staynew
PRECIPITATOR
THE LATEST DESIGN DEVELOPMENT FOR ELECTRONIC AIR CLEANING

DOLLINGER CORPORATION, 11 Centre Pk., Rochester 3, New York

New Bulletin 400 has information of interest to every engineering department. Keep it handy to answer filtration questions on industrial ventilation.

ELECTRO-STAYNEW BULLETIN CONTAINS...

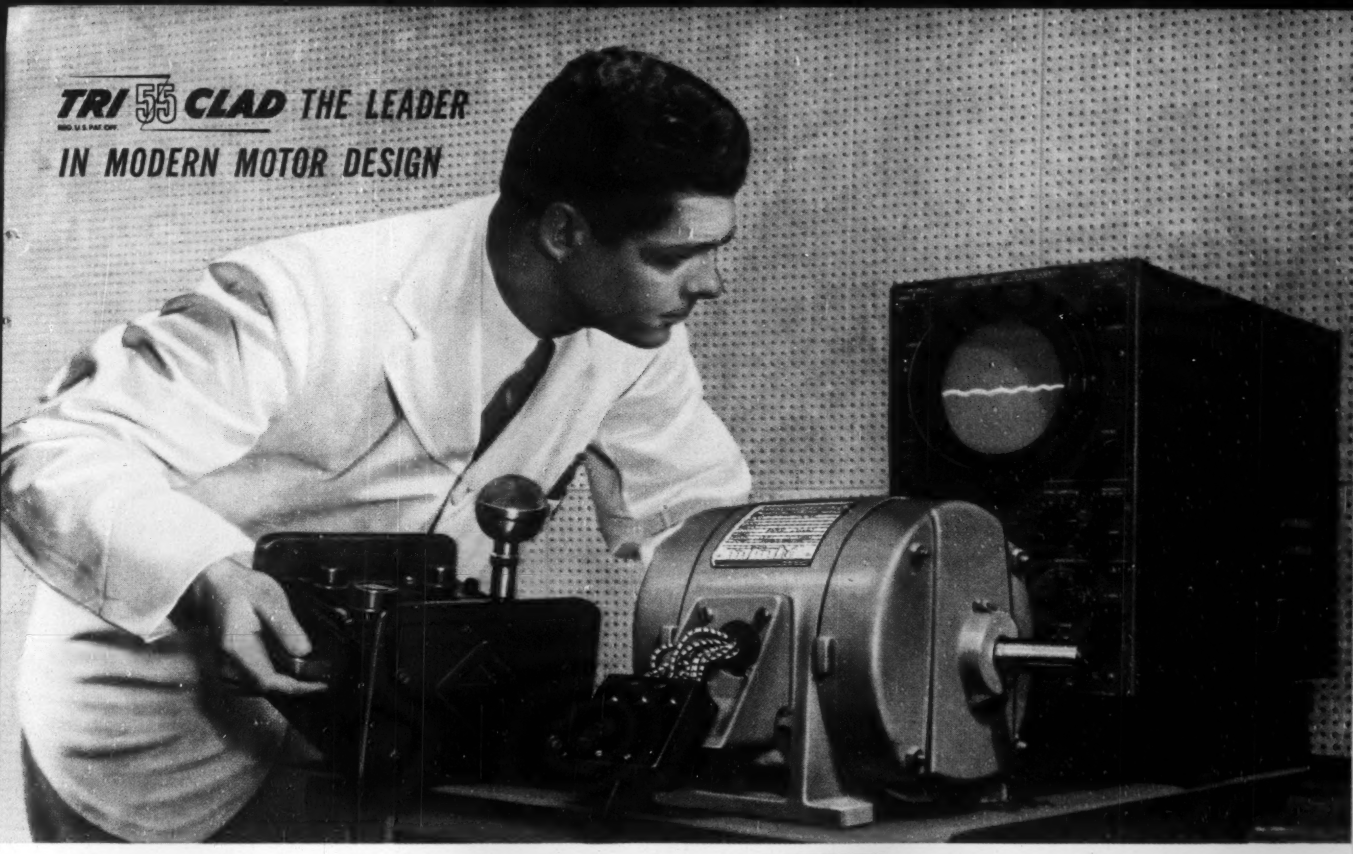
- detailed diagrams on how the Electro-Staynew cleans air.
- description of all component parts.
- cutaway view of suggested installation.
- complete mechanical and electrical specifications.
- examples of fool-proof safety features.
- report of studies that prove Electro-Staynew sets new standards for economy.
- convenient chart of sizes and material list.

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

9 Centre Park Rochester 3, New York

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED



Sound-room tests prove TRI 55 CLAD motors operate at greatly reduced noise level!

REG. U.S. PAT. OFF.

Here's the new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact G-E Tri/Clad '55' motor, in ratings from 1 to 30 hp a-c.

To reduce noise, G. E. engineers developed a new concept —a sonant motor—a motor that sounds pleasing to the ear. They studied, and then reduced, the causes of motor noise—bearing rattle, magnetic hum, and windage. Sound room tests prove the Tri/Clad '55' is sonant, runs quieter.

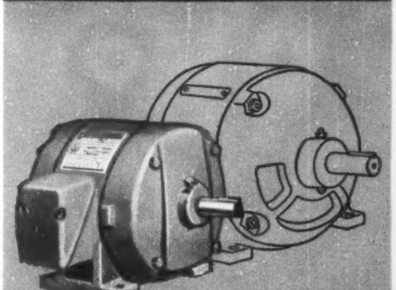
In addition, the modern looking Tri/Clad '55' motor is lighter and smaller—saves weight, saves space.

Try this new motor. See for yourself how the Tri/Clad '55' can help reduce noise and save space in your own equipment. Contact your G-E Apparatus Sales Office or G-E Motor Supplier today. For bulletins, write General Electric Co., Section 648-12, Schenectady 5, New York.

Progress is our most important product

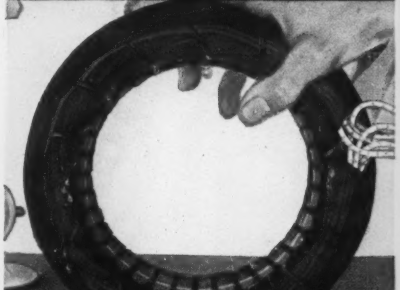
GENERAL ELECTRIC

LIGHTER, SMALLER



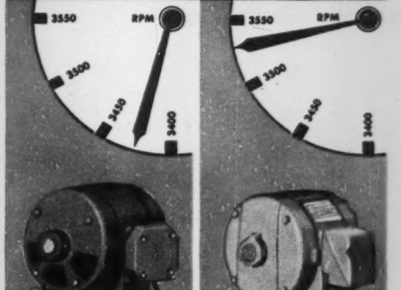
MORE COMPACT MOTOR means more horsepower per pound—saves space, weight—is easier to handle.

BETTER INSULATION SYSTEM

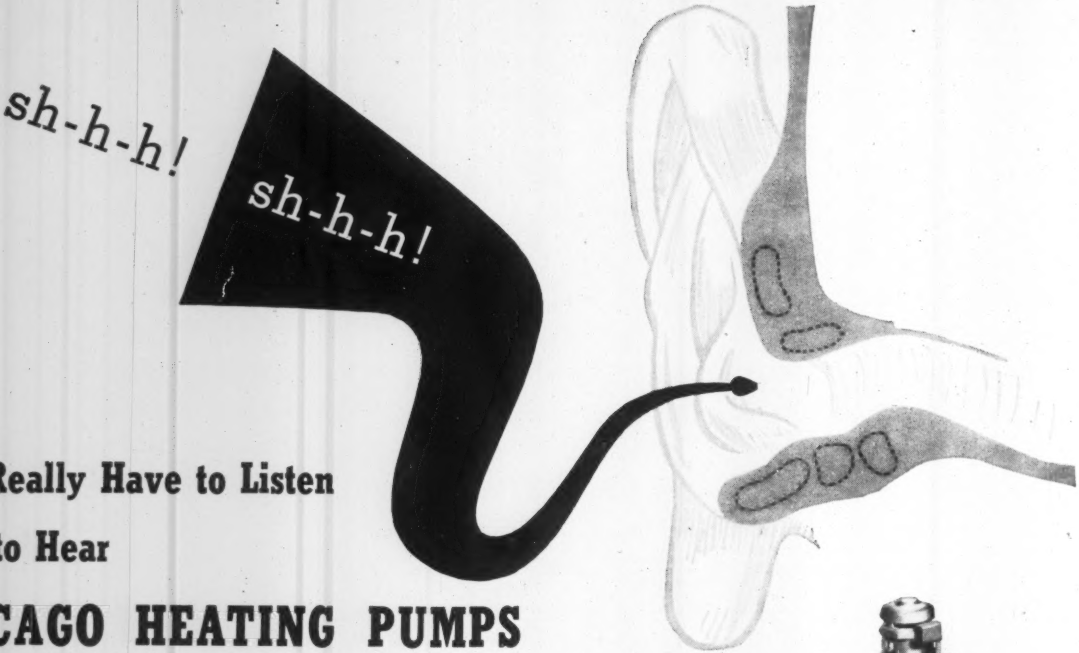


SILICONE RESIN COATING on stator plus stronger polyester-film slot and phase insulation increase electrical life.

BETTER PERFORMANCE



HIGHER FULL LOAD SPEEDS is typical of many performance improvements in the new Tri/Clad '55' motor.



You Really Have to Listen to Hear

CHICAGO HEATING PUMPS

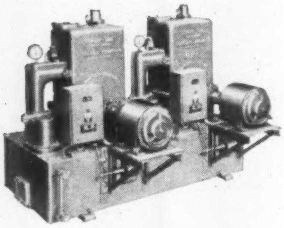
Quality Makes Them Quiet

In a heating pump, silence—or near silence is golden. It tells you, first of all, that here is a precision-made pump that will "pay off" through years of service . . . with least maintenance and continuous high performance. And quiet operation of a heating pump means quieter operation of the entire heating system.

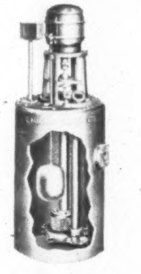
A Size for Every Job

There are Chicago Heating Pumps for every type of heating job. This means you can get a Chicago Pump that exactly fits your requirements — in capacity, pressure, and equivalent direction radiation ratings. You don't have to accept a substitute that may labor at heavy loads and then need excessive maintenance to keep it in service. Specify Chicago Pumps and be sure of quiet, efficient pumping — always.

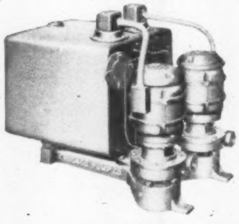
Type AVC Condensation Pump & Receiver for 5,000 to 10,000 EDR and 10 to 30 psi. Write for Bulletin 245.



Duplex Condo-Vac Return Line Vacuum and Boiler Feed Pump for vacuum systems at pressures to 40 psi. 2,500 to 150,000 EDR. Described in Bulletin 270.



Type CLL1 Vertical Condensation Pump & Receiver for low returns. 1,000 to 40,000 EDR and 10 to 52 psi. See Bulletin 255.



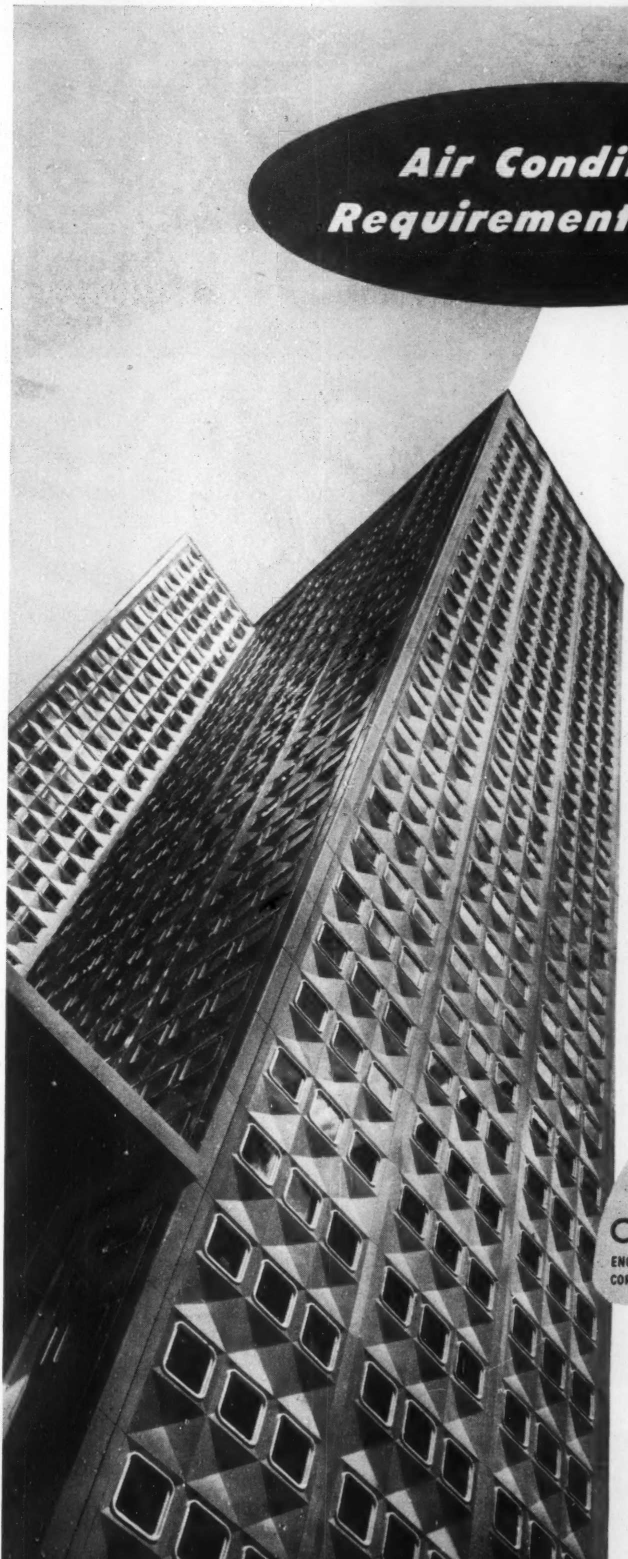
Sure Return Condensation Pump and Receiver. Will not steam bind. For low and med. press. systems to 75,000 EDR. Described in Bulletin 250.

Duplex FC Condensation Unit for capacities up to 50,000 EDR and 150 psi. Described in Bulletin 260.

CHICAGO PUMP COMPANY
BUILDING and INDUSTRIAL DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Bilge Pumps Pumps for every industrial use.



Air Conditioning Requirements Halved

IN THIS modern skyscraper, the air conditioning system is only about half the size of the conventional system. Dorex Air Recovery makes this important saving possible.

Dorex Air Recovery is a simple method by which used air can be "reconditioned"—made completely odor-free and fresh for reuse. This sharply reduces the amount of outside air that has to be taken into the system and thus reduces the size of heating and cooling equipment required—effecting important savings on original investment and in operating costs over the years.

In fact, averages—drawn from more than twenty years' experience with over 10,000 Dorex installations—show that every $100 invested in Dorex Air Recovery should return about a $400 saving in original ventilating equipment...and every $1 spent for Dorex maintenance should save some $4 in operating costs.

Mail the coupon today for full information about Dorex Air Recovery. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR
ENGINEERING
CORPORATION

dorex®
air recovery

CONNOR ENGINEERING CORP.
Dept. A-104, Danbury, Conn.

Please send me, without obligation, full information on Dorex Air Recovery.

Name ______________________________

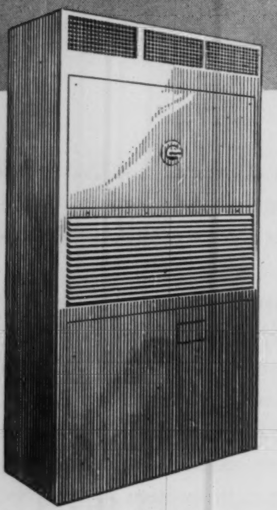
Position ______________________________

Company ______________________________

Street ______________________________

City ____________ **Zone** ______ **State** ________

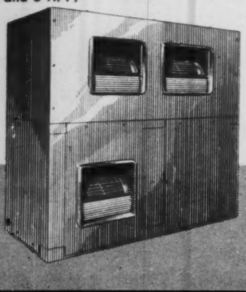
There's money in the air...
when you sell **CHRYSLER AIRTEMP!**



"Packaged" Water-Cooled Air Conditioners in 6 models, from 2 to 15 H. P.

REPLACEMENT OR REFUND OF MONEY
Guaranteed by
Good Housekeeping
IF NOT AS ADVERTISED THEREIN

"Packaged" Waterless Air Conditioners—no water needed, no plumbing required. 2, 3 and 5 H. P.



does the name help you sell?

THIS ONE WILL!

You will find that the great majority of your prospects—even those who have had no previous interest in air conditioning—know and respect the famous Chrysler Airtemp name. It's the name they associate with engineering leadership and products of only the highest quality. It's the name *you need* to make your job of selling "Packaged" air conditioning so much easier—and more profitable!

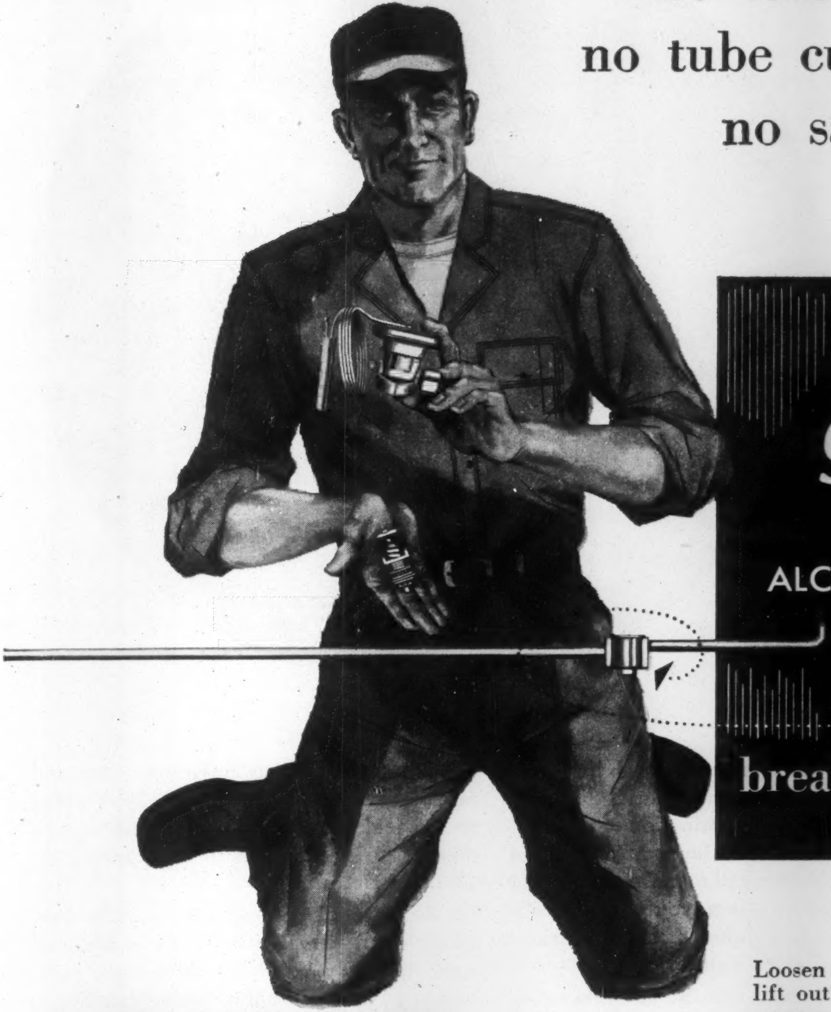
The pioneer name in "Packaged" air conditioning offers you many other important advantages, too, in the Franchise that really means business. Your inquiry is invited now. Write Airtemp Division, Chrysler Corporation, Dayton 1, Ohio.

AIRTEMP
DIVISION OF CHRYSLER

Air **C**onditioning's
other name . . .
Chrysler **A**irtemp

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS AND INDUSTRY

no torch
no tube cutter
no saw needed!



you service

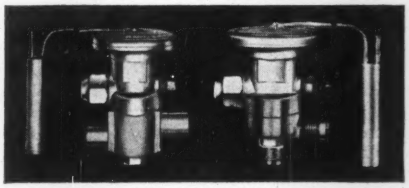
"T" SERIES
ALCO THERMO VALVES

without
breaking connections

Loosen cap screws, raise power element, lift out the cage . . . that's all! Alco come-apart construction gives instant access to all working parts . . . for cleaning, repair or capacity change.

2½-inch headroom is sufficient space for installation and servicing!

Save money—save servicetime—install ALCO "T" Series Thermo Valves!



SOLDER OR SAE FLARE

For all temperature ranges—all operating conditions.
.5 ton—50 tons "F12"
.5 ton—80 tons "F22"

SEE YOUR ALCO WHOLESALER

ENGINEERED
for service
for life

ALCO

ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

6200

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

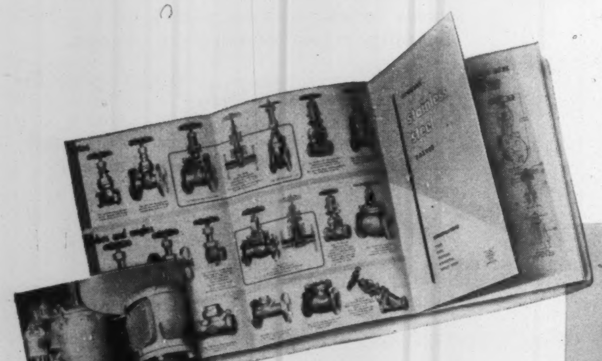
Trim costs with this hook-up for valve-killing corrosive services

Stainless Steel PLUS Jenkins Quality

To end high valve mortality from most corrosive liquids, and to control fluids that must be kept free from contamination or discoloration, stainless steel is the right metal. But it takes more than metal to make a valve. For dependable performance, you need the two-way hookup — Stainless Steel *and* Jenkins time-proved Valve Engineering.

With the increased demand for processing equipment that resists corrosion, more and more Stainless Steel Valves have been added to the Jenkins line. It now includes types, designs, sizes and alloys to meet practically all industrial needs.

Let the famous Diamond trade-mark be your guide when you choose valves of stainless steel. As on *any* Jenkins Valve, it means *extra value* . . . longer, trouble-free service life.



NEW BOOKLET describes the wide range of types, sizes, pressures, and alloys available in Jenkins Stainless Steel Valves, with diagrams and dimensions. Includes description of alloys, helpful information on selection, and survey forms. Ask for Form 200. Jenkins Bros., 100 Park Ave., New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

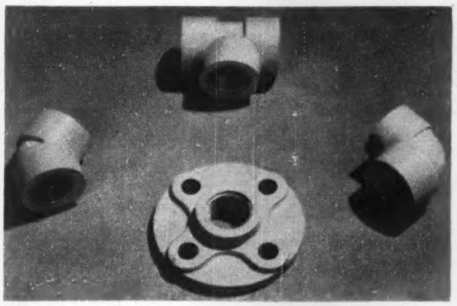
SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

EQUIPMENT DEVELOPMENTS . . .

For reviews of Recent Trade Literature see Page 260.

Plastic Pipe Fittings

A new patented process of injection molding of unplasticized polyvinyl chloride will be used exclusively by a company just organized, Tube Turns Plastics, Inc., in the manufacture of industrial plastic pipe fittings and custom molded products. The new company is capitalized at $1.5 million . . . . Located in Louisville, the company was established jointly by Tube Turns Div. of National Cylinder Gas Co. and Jackson & Church Co. Its formation was announced by George O. Boomer, president of Tube Turns, Louisville, and Clifford W. Stuart, president of Jackson & Church, Saginaw, Mich.



The new company is at present the only source of injection molded PVC fittings as a result of the acquisition from Jackson & Church of the first injection molding machine and techniques for manufacture of these fittings on a commercial scale. The manufacturing operation involves a patented preplasticizing process originally developed by James W. Hendry, Jackson & Church vice president.

"The process is a unique development that will open up many new applications for PVC in industry," said Mr. Boomer and Mr. Stuart, adding, "Studies completed by two U.S. engineering and research organizations indicate that in the immediate and long range future, PVC will be used extensively in the chemical, petroleum, paper and other industries where serious corrosion problems are encountered."

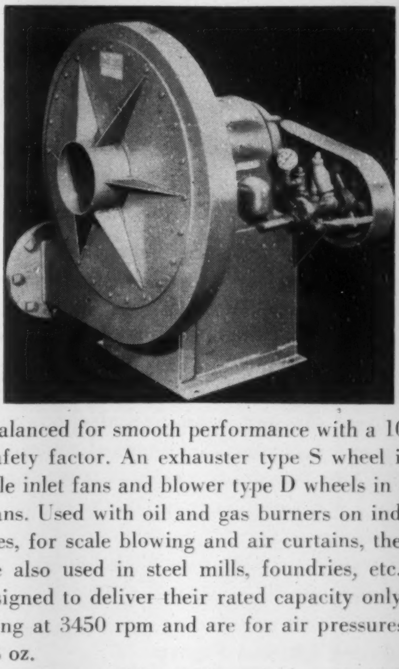
Many advantages are cited for piping systems fabricated of PVC. They offer excellent resistance to a wide range of acids and alkalies, according to the announcement. They possess high burst strength and can be furnished in a high impact strength grade. In addition, they are light in weight, unaffected by weather and can be installed easily and economically, the company officials state.

The new company will also make fittings and custom molded products from other thermoplastics and from thermosetting plastics.

David L. Perrot, chairman of the board and executive committee of Jackson & Church, was elected board chairman of the new company. Mr. Boomer, chairman of the executive committee of National Cylinder Gas, was elected president. He also is president of The Girdler Co., another National Cylinder Gas division. Carl McLaughlin, formerly assistant to the executive vice president of Tube Turns, was elected executive vice president. James W. Hendry and John G. Seiler were elected vice presidents. Mr. Seiler is executive vice president of Tube Turns.

High Pressure Blowers

High pressure blowers, available in single and double inlet fans, direct or belt driven, designed to maintain a constant pressure while supplying varying volumes of air . . . . They are extremely quiet because of their simple design and rigid construction, the manufacturer reports. Wheels are designed to be light weight and statically and dynamically balanced for smooth performance with a 100 percent safety factor. An exhauster type S wheel is used in single inlet fans and blower type D wheels in double inlet fans. Used with oil and gas burners on industrial furnaces, for scale blowing and air curtains, the blowers are also used in steel mills, foundries, etc. They are designed to deliver their rated capacity only when operating at 3450 rpm and are for air pressures from 4 to 24 oz.



Manufacturer—Chicago Blower Corp., 9867 Pacific Ave., Franklin Park, Ill. (Request information on company letterhead.)

School Heating Control System

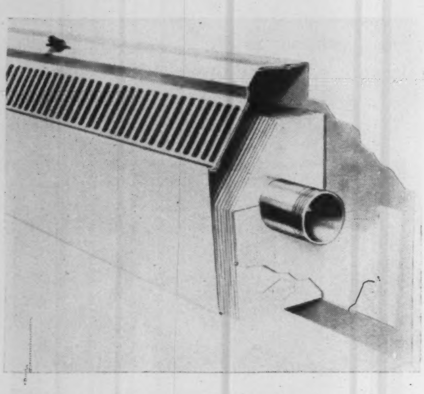
Heating control system for schools that gives teachers control over temperatures in their own classrooms and, at the same time, permits the principal to maintain pushbutton supervision over conditions in all classrooms without leaving his office.

. . . Thermostats in each classroom are wired to a master control monitoring panel installed in the principal's office. By pressing a button he can read the temperature in any classroom. The thermostat also includes a fire-detecting element and relay which sounds an alarm and indicates on the master control panel the exact location of a blaze anywhere in the building.

Manufacturer—Minneapolis-Honeywell Regulator Co. 2641 4th Ave. S., Minneapolis 8.

Baseboard Heating Units

Inside turbulator extending the entire length of the steel pipe, designed to result in more heat and in fuel savings, is featured in 1955 line of "Florvector" baseboard heating units.



According to Chester S. Stackpole, general sales manager of the manufacturer's heating and cooling division, the turbulator eliminates possibility of a "core of hot water" reducing efficiency. It mixes the water as it passes through the pipe to insure uniform temperature of all the water in a given section.

Design of the unit, with five-sided fins, not only provides an unobtrusive streamlined appearance, he said, but "provides steady, evenly distributed heat with less than a 4 F variation from floor to ceiling without drafts."

Manufacturer—Union Asbestos & Rubber Co., Heating and Cooling Div., 332 S. Michigan Ave., Chicago.

Corrosive Liquid Pump

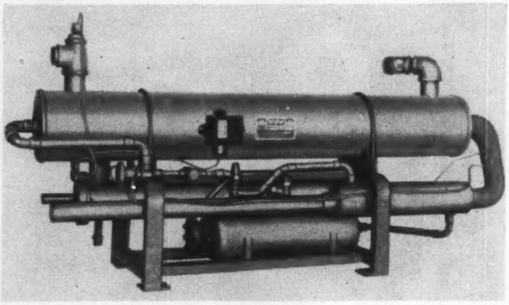
Pumping corrosive liquids at controlled rates by a new type of pump employing a stainless steel bellows was demonstrated at the Instrument Show in Philadelphia last month . . . . The thin wall bellows, 0.004 in. thick, is constructed of single ply, Type 316 or 321 stainless steel strip. The pump is used to maintain a controlled volume flow for high melting, low boiling or gaseous materials, as well as for chemicals.

A lock nut adjustment controls the stroke of the bellows, which governs the rate of flow. Since the cross sectional area of the bellows remains constant, changing the stroke accurately controls the displacement. Flow rates may be controlled from 15 to 7000 milliliters per hr.

Manufacturers—Flexonics Corp., 1391 S. Third Ave., Maywood, Ill., makes the bellows. Research Appliance Co., Box 463, Pittsburgh 9, Pa., makes the pump.

Packaged Water Chillers

Package chillers designed to meet the requirements of contractors who prefer a chiller to which they can tie in condensing units and water pumps . . . . The new units feature "Inner-Fin" construction of all refrigerant passages, a patented feature which promotes compactness and provides greater cooling capacity with less bulk.

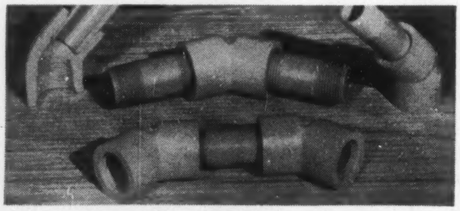


For use on chilled water air conditioning systems, drinking water or beverage cooling applications, and for industrial water cooling, the chillers are available in capacities from 10 through 35 tons. Condenser, chiller, and all water piping are of nonferrous metal.

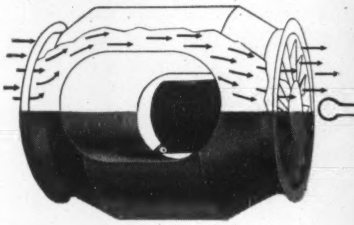
Manufacturer—Heat-X-Changer Co., Brewster, N. Y.

Plastic Pipe and Fittings

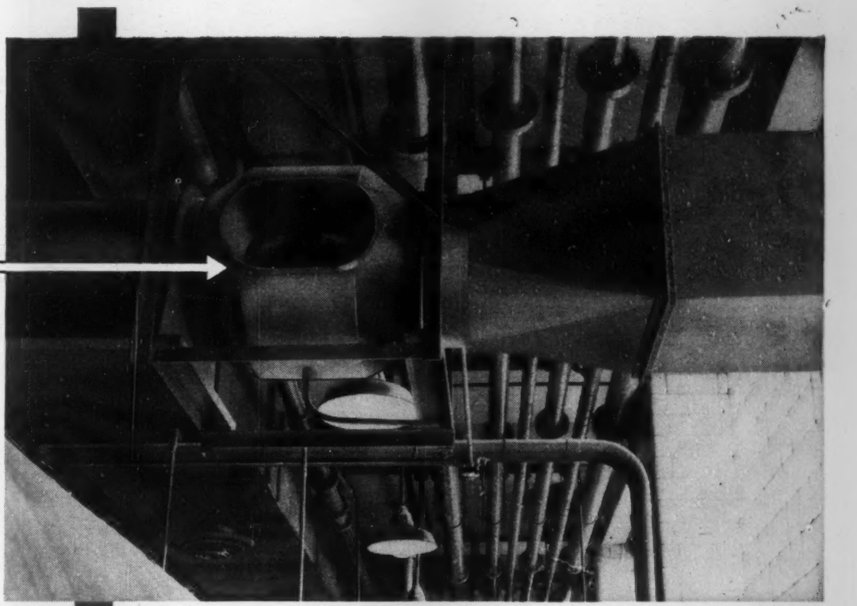
Corrosion-resistant, rigid "Dur-Ace" plastic pipe with high impact resistance and toughness . . . . It is a general purpose material capable of handling most common corrosives, is light in weight, odorless, tasteless and non-contaminating, according to the manufacturer. Though satisfactory for petroleum products generally, it has limited resistance to organic solvents. Moisture absorption rate is low. It maintains good strength, rigidity and chemical resistance over a temperature range of from minus 40 F to 170 F. Applications include many outdoor uses, such as buried water lines, crude oil lines, gas lines, brine lines, etc.



The pipe is now supplied in sizes from ½ to 2 in.,



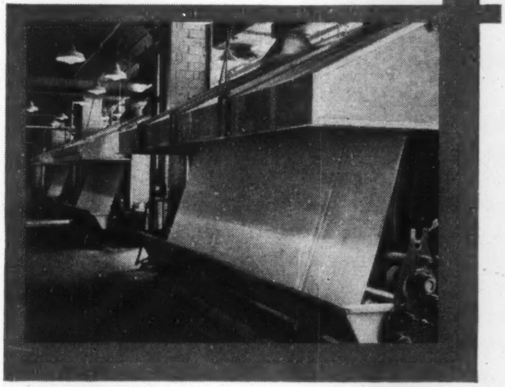
Bifurcators are available with fan wheels from 12" up to 48" in diameter, with exhaust capacities up to 45,000 CFM.



FUME *problem...* SPACE *problem*

BIFURCATOR® FANS SOLVE *BOTH* AT CLINTON FOODS INC.

Sulphur dioxide fumes from the starch filters are exhausted by Bifurcator Fans installed right in the ductwork.



In one manufacturing process at the Clinton, Iowa, plant of Clinton Foods Inc., starch filters give off sulphur dioxide fumes which must be exhausted. Choosing exhaust fans for this application, Clinton Foods' engineers had two major requirements. First, the fan motor must be protected from the fumes. Second, fan units must be very compact to fit into the limited space available.

DeBothezat Bifurcator Fans meet both these requirements ideally. The Bifurcator is a direct motor-driven fan in a divided housing. Its motor is in an isolated chamber around which fumes are by-passed, so that the motor stays cool, clean and accessible. A Bifurcator installs just like a flanged section of ductwork, and is scarcely larger in diameter than the ductwork.

The Clinton Foods plant now has 39 Bifurcators in operation, built of stainless steel to resist corrosion.

If *you* have a similar fume removal problem, Bifurcator Fans may be the economical answer for you, too. Why not send for an illustrated catalog now?

DeBothezat Fans
Division of
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

MAIL COUPON TODAY

DeBothezat Fans Division, Dept. HP-1054
American Machine and Metals, Inc.
East Moline, Illinois

Send me free catalog on Bifurcators for exhausting hot, corrosive, flammable and explosive fumes.

FIRM NAME

ADDRESS

CITY ZONE STATE

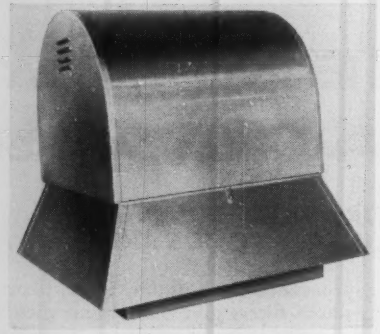
NAME AND TITLE

in standard 20 ft lengths, with two wall thicknesses, extra heavy duty (IPS Schedule 80), and standard (IPS Schedule 40). Fittings, flanges, nipples, etc., are available, with standard IPS threads. The pipe may be threaded with standard pipe threading tools or machines, and can be bent in regular pipe forming equipment if it is first heated to soften it.

Manufacturer—American Hard Rubber Co., 93 Worth St., New York 13, N. Y.

Power Roof Ventilators

Addition of "Model B" series to the present line of power roof ventilators . . . . The new model is available in sizes from 12 in. to 60 in., to handle requirements from 1000 to 3800 cfm. The 12 in. size is a direct motor driven unit, while the larger sizes are belt driven to secure the cfm desired. All units are equipped with a backwardly inclined centrifugal fan wheel. The motor hood is hinged for easy access to the drive and the motor is isolated out of the air stream. Available accessories include automatic and motorized dampers, bird screens and extended curbs.



Manufacturer—W. R. Carnes Co., S. Main St., Verona, Wis.

Centrifugal Pumps

Line of close coupled and ball bearing flexible coupled end suction pumps . . . . Applications include cooling towers, chilled water and hot water circulating systems, pneumatic water systems, booster service, etc. Capacities range from 10 to 400 gpm at heads up to 190 ft. Pumps are equipped with a ceramic face seal resistant to wear, the company reports.

Manufacturer—Chicago Pump Co., 622 Diversey Parkway, Chicago 14.

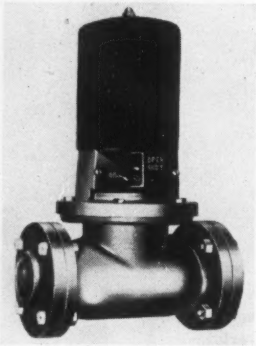
Motorized Gas Valves

Motorized valves for automatic fuel control on gas fired boilers, furnaces, ovens, kilns, and other gas combustion systems . . . . Two wire motor operator, soft neoprene seat construction, and lightweight aluminum body (FM approved) are features.

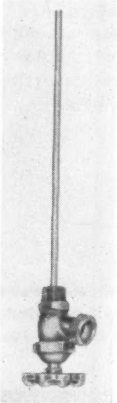
The spring loaded plunger and neoprene seat are designed to assure fast, positive shut-off in the event of electrical failure. Motor and plunger assembly are easily removed for servicing the valve without breaking line connections. Position of the diaphragm ("open" or "closed") is shown by an indicator on the motor mounting bracket.

Flange mountings, with aluminum companion flanges, are furnished as standard equipment. Now in production in 1, 1¼, 1½, 2, 3 and 4 in. sizes.

Manufacturer—Eclipse Fuel Engineering Co., Rockford, Ill.



Gas Valve



Expansion Tank Valve

Expansion Tank Drain Valve

"Drain-O-Tank" valve for recharging waterlogged compression tank . . . . The manufacturer states that one important feature of the valve design makes it almost impossible to waterlog an expansion tank except by loss of air from a leaky tank or normal air absorption into the water itself. The valve is ½ in. size and has a standard ¾ in. hose connection for a drain.

Manufacturer—Bell & Gossett Co., 8200 N. Austin Ave., Morton Grove, Ill.

Weather Resistant Pressure Controls

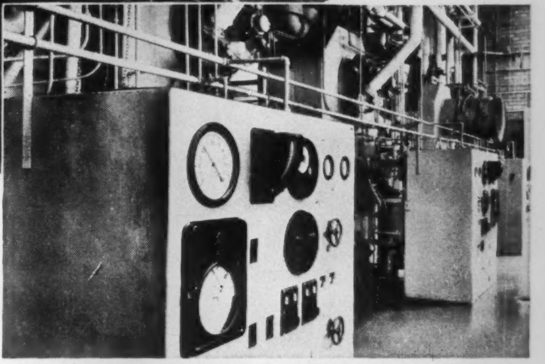
Series DAW pressure controls designed for outdoor use . . . . Applications include chemical, food processing and textile plants and other industries. The controls conform to NEMA specifications for semi-tight, driptight, weather resistant (waterproof, splashproof, sleetproof and moisture resistant) and watertight (not submersible) controls. The case is flanged and has a ¼ in. IPS connection. The cover is vented to provide draining. Controls are available in 17 operating ranges from 30 in. of vacuum to 300 — 2500 psi with sensitivities from 2 oz to 20 psi, depending upon range selected.

Manufacturer—The Mercoid Corp., 4201 W. Belmont Ave., Chicago 41.

(*Continued on page 220*)

NABISCO
NATIONAL BISCUIT COMPANY
NABISCO

Air view of Nabisco's new Chicago bakery indicates its unusual architectural conception as well as its huge size.



B&W Integral-Furnace Boilers, Type FM, in service at Nabisco. Delivered completely shop-assembled, FMs are ready to skid or lift into position, connect to services, and place in operation.

keeping steam cheap . . .

World's Largest Bakery

served by 3 B&W *Integral-Furnace Boilers, Type FM*

Typical of the increasing demand for the B&W Type FM Boiler was the choice of a multiple-unit installation for the largest, most modern bakery in the world, capable of producing 167 million pounds of baked goods annually. Occupying 12 acres of a 45-acre site, National Biscuit Company's new Chicago bakery is an outstanding example of scientific application of straight-line mass production methods combined with the highest standards of cleanliness and sanitation, and striking architectural beauty.

Since January 1952, the three FM units have been generating steam for heat, hot water, and various processing operations, such as melting shortening for easier unloading from tank cars and to facilitate its distribution within the plant.

Designed to produce 25,000 lb of steam per hr each at 110 psi pressure, the B&W Units are oil-fired—make a positive contribution to the elimination of smoke and fly ash required by Nabisco. Choice of the three FM boilers rather than a single, larger unit resulted after careful consideration of all factors and a realization that the FM unit offers the benefits of "package" steam combined with many cost-saving big-boiler advantages.

Satisfaction with the performance of the B&W Type FM Boiler is proved by the number of units in service and on order for industries, utilities, and other users in practically every category. In terms of total steam capacity they add up to about 9,000,000 lb per hr, and better than half of this capacity is in multiple-unit installations. The compact, shop-assembled FM is available in standard sizes for loads ranging from 2900 to 36,000 lb per hr at steam pressures to 235 psi—is also available for higher pressures.

COST-SAVING FEATURES
of the
B&W Type FM Boiler

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Bulletin G-76A describes in detail the many cost-saving features of this self-contained, popular small boiler. Write for your copy. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

BABCOCK & WILCOX

B&W
BOILER DIVISION

G-642

# BASE-RAY
for
Beauty and *Comfort!*

BURNHAM BASE-RAY RADIANT BASEBOARD

BASE-RAY* Radiant Baseboard's matchless beauty is a sales argument that speaks volumes to your prospects. Women start mentally picturing the endless furniture arrangements they can have with BASE-RAY the moment they lay eyes on it. Only 7″ high by 2″ deep, BASE-RAY saves floor space, creates a roomier-than-it-is effect . . . leaves all wall space free. And BASE-RAY can't be topped for comfort—it's truly the best way to enjoy the magic of hot water heating. BASE-RAY is made of rugged cast iron for lifetime performance, a fact worth mentioning a couple of times to any prospect. Remember, Burnham was *first* with the Radiant Baseboard idea (1945) and, despite widespread imitation, Burnham continues to be the leader in quality and engineering know-how.

BURNHAM BOILERS are quality all the way . . . quality engineering, quality materials and quality performance. Display, feature and "talk up" the famous Burnham line and you'll profit *two* ways . . . first, from the sale at hand and, second, you'll be building the kind of reputation that means *future* business. There's a rugged Burnham Boiler for every fuel and all of them give your customers plenty of domestic hot water for kitchen, laundry and bath the whole year 'round. Mention that fact—it's a powerful sales factor! Add to this the obvious advantages of hot water heating over other methods and you have plenty of "reasons why" for even the toughest prospect. AND ALL Burnham Boilers are made of cast iron for long life and trouble-free service.

**Reg. U. S. Pat. Off.*

Burnham Radiant Heating Since 1873

Burnham Corporation
IRVINGTON • NEW YORK
FIRST IN THE MANUFACTURE OF BASEBOARD HEATING

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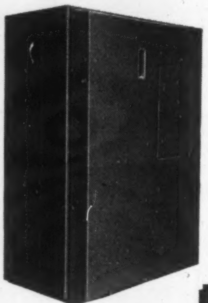
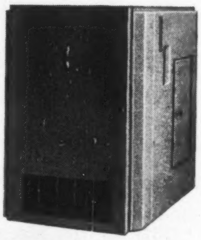
Please send full information on:
YELLO-JACKET PACEMAKER GAS BOILER BASE-RAY
Name ....
Address ....
City .... State ....

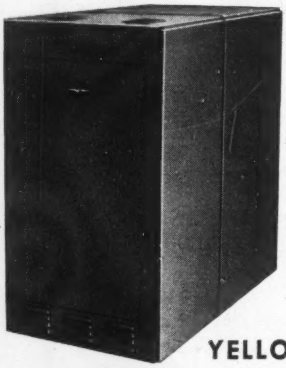
# Burnham Boilers
for
Dependable Performance!



PACEMAKER*



GAS BOILER
PB SERIES

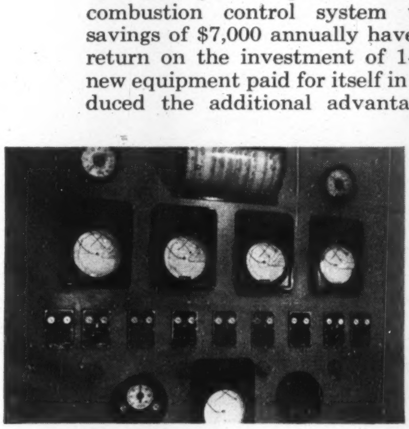


YELLO-JACKET

DuPont saves $7,000 a year

with just partial modernization of coal burning equipment

The boiler plant at DuPont's Barksdale Works was operating inefficiently, due to an old forced draft system and unwieldy combustion control. DuPont engineers decided to modernize these operations, estimating that the cost would be amortized quickly through the increase in efficiency. An up-to-date draft fan and automatic combustion control system were installed. Today savings of $7,000 annually have been realized—a gross return on the investment of 140%! Not only has the new equipment paid for itself in one year, but it has produced the additional advantages of reduced ash-pit losses, lowered maintenance costs, increased steaming capacity.



Control Board at Barksdale Works. Steam generating equipment consists of four 15,000 lb./hr. 150 psi stoker-fired boilers.

Thousands Saved

More and more plants are saving thousands of dollars yearly burning coal the modern way. The reasons are obvious. In most industrial areas, coal is the cheapest fuel available. Not only do you actually get more BTUs per dollar from coal, but the efficiency of modern combustion equipment extracts even more benefit from coal's inherent energy. What's more, today's automatic coal and ash handling methods mean minimum labor costs. Coal is *clean*, too. It travels in dust-tight chutes; ashes are piped out through pneumatic tubes; there is no smoke problem. And between our vast coal reserves and highly mechanized coal production, you can count on coal remaining plentiful and its price remaining stable.

Investigate Fuel Costs

If you're planning to modernize your old plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal burned the modern way compares to other fuels for *your* plant. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars every year.

BITUMINOUS COAL INSTITUTE

A department of National Coal Association
Southern Building, Washington 5, D. C.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address above.

Take this common sense approach to **PUMPS**

Save Time, Money, Trouble

ALLIS-CHALMERS
Air Conditioning
PUMPS

Get specific engineering help

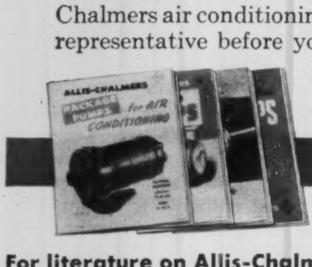
You'll find it pays off in hard cash to rely on Allis-Chalmers for your air conditioning pump needs. That's because your A-C representative or distributor is an experienced, highly qualified specialist who will give you full cooperation at every step of the way. He'll help you pre-engineer the setup. In many cases he'll make valuable suggestions which result in a simpler, more effective layout.

Get immediate delivery from stock

A-C air conditioning pumps in a complete range of types and sizes are carried in stock by Regional Warehouses and Authorized Distributors throughout the country. Your representative will show you how to expedite pump selection and ordering . . . make sure you get the unit that gives you maximum performance at minimum cost. Find out for yourself why it's highly profitable in terms of time, money, and customer satisfaction to install Allis-Chalmers air conditioning pumps. Contact your representative before you start your next job.

A-4396

AIR CONDITIONING PUMP


ALLIS-CHALMERS
PACKAGE PUMPS for AIR CONDITIONING

A-C
ALLIS-CHALMERS

Electrifugal is an Allis-Chalmers trademark.

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Electrifugal Pumps, Bulletin 52B6140 . . .
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. . . Vertical Mounted Pumps, Bulletin 52B6975.
Write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

FROM WHERE WE SIT
TYPHOON
HAS THE MOST TO OFFER

"Factory-prepared literature opens up leads for me."

—Dan McKenzie, Biscayne Air Conditioning Co., Miami

"Complete Typhoon line gives every one of my prospects the perfect setup for his needs."

—Clyde L. Copp (left), Typhoon dealer in Tulsa, shown with satisfied customer, Perry Ward, restaurant manager

"My Typhoon District Manager helps me figure complex jobs competitively and profitably."

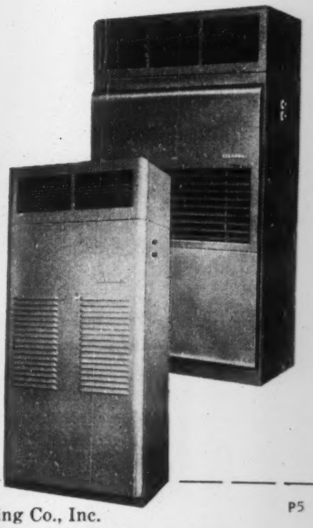
—Don Kissell (left), Los Angeles dealer, shown with Art Krell, Typhoon West Coast District Manager

"Trouble-free performance of rugged Typhoon units chalks up satisfied customers for me."

—Ernest W. Farr, Bell Refrigeration Corp., Cleveland

"A phone call to Typhoon and factory engineers iron out tough technical problems for me in jig time."

—Carl Muno, McCarty Bros. Equipment Corp., Chicago



Commercial Air Conditioners
Residential Year-Round Units
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AIR CONDITIONING

The Typhoon franchise puts you on the smoothest-working factory-dealer team in the business. Write for information today.

Typhoon Air Conditioning Co., Inc.
505 Carroll St., Brooklyn 15, N. Y.
Specialists in Air Conditioning Since 1909

Typhoon Air Conditioning Co., Inc. P5
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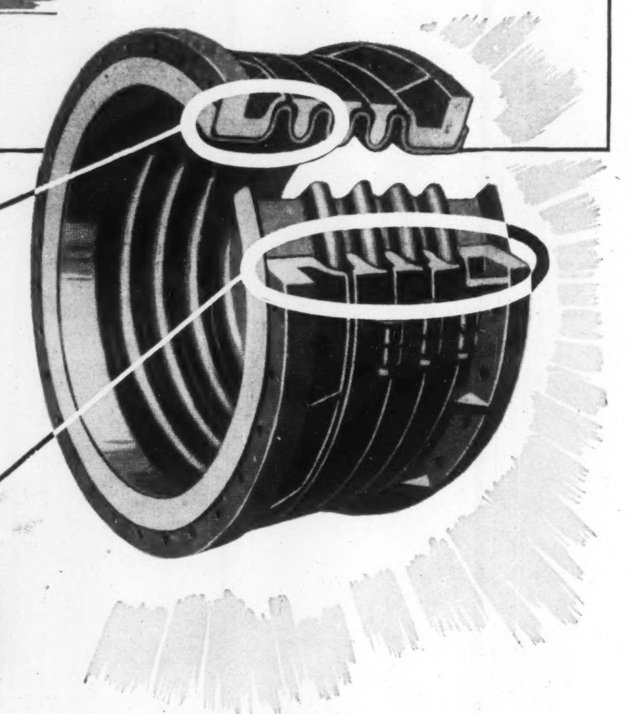
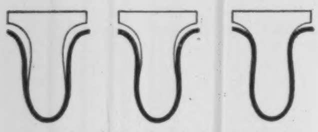
Badger

Expansion JOINTS

Typifying Joint Engineering at its Best



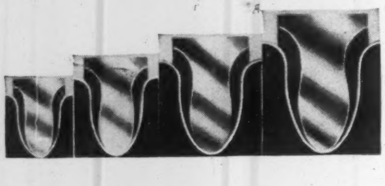
LONG-LIFE FEATURE



the ALL-CURVE, directed flexing, corrugation.*

LONG-LIFE FEATURE

PROPORTIONAL DEPTH of corrugation for each range of diameters and traverse.**



Badger Directed Flexing Self-Equalizing Expansion Joints give exceptionally long *service* life, proof of which has been well established in the City of New York where more than 4,000 of these Badger Joints are installed in the underground steam lines of the largest district heating company in the world.

*** The exclusive all-curve directed flexing corrugations and matching equalizing rings distribute the flexing stresses over the entire area of all corrugations.**

**** For each range of diameters there is a carefully calculated depth of corrugation with a defined limit of traverse.**

Each Badger Expansion Joint is originally designed with the proper number and depth of corrugations for maximum flexibility and service life at full rated traverse.

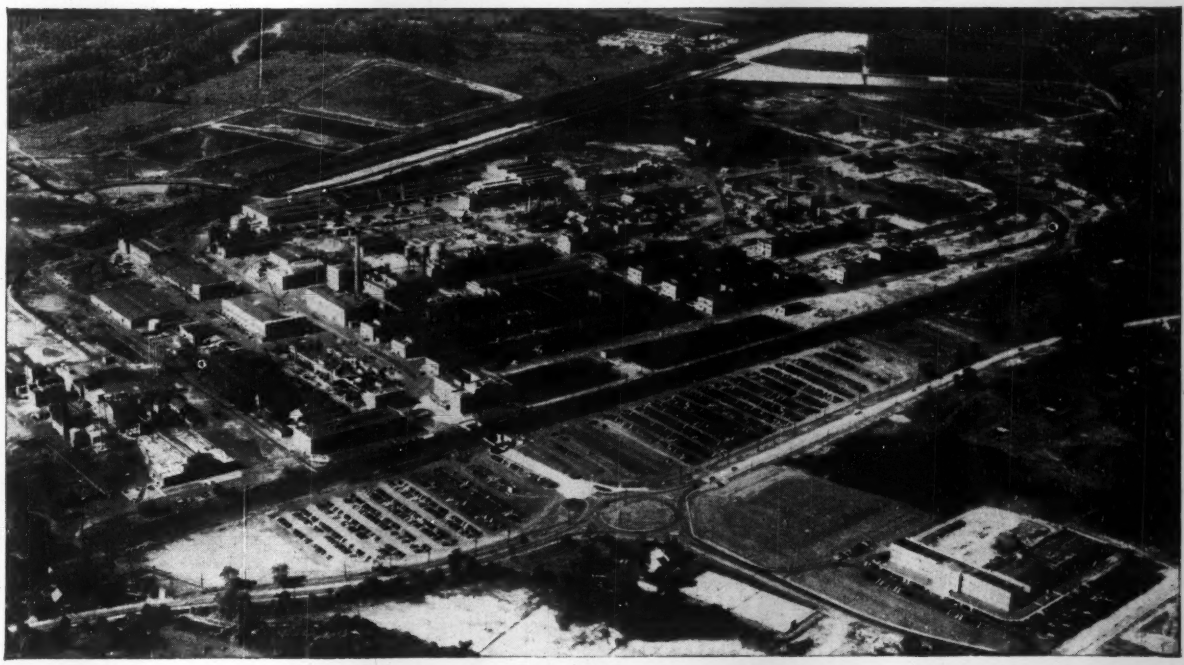
Remember — when you want long trouble free service in your distribution system, there is no substitute for the proper number and depth of corrugations. COMPARE BEFORE YOU BUY and to be sure you get the best, specify "BADGER".

BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE • MASS.

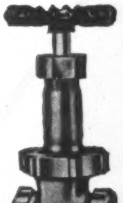
Oh, I see



Bound Brook, New Jersey, plant of the American Cyanamid Company

. . they're using OIC Valves at

AMERICAN Cyanamid COMPANY



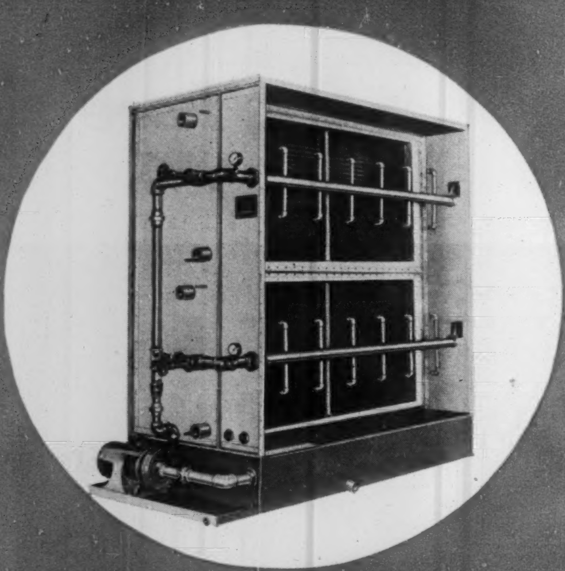
The tremendous gallonage of liquid traffic in the miles of piping of a chemical plant demands accurate, dependable control. Valves must deliver positive action, and resist the corrosive wear of chemicals for long, maintenance-free periods.

This is the reason OIC Valves have gained acceptance at American Cyanamid Company . . . and other chemical producers and processors.

THE OHIO INJECTOR COMPANY • Wadsworth, Ohio

OIC
FOUNDED 1883

VALVES | FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON



FOR
DEPENDABLE SERVICE
AND LONGER LIFE
INSIST ON

A&R SPRAYED COIL DEHUMIDIFIERS

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COILS—VERTICAL OR INCLINED

BLADE OR MAT ELIMINATORS

FACTORY INSULATION

CONSULT NEAREST FACTORY REPRESENTATIVE
OR WRITE FOR CATALOG SECTION 40

AIR & REFRIGERATION CORPORATION

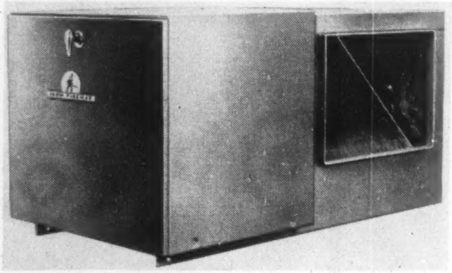
439 MADISON AVE. NEW YORK 22, N. Y.
271 MILTON AVE., S.E. ATLANTA, GA.

EQUIPMENT DEVELOPMENTS

From p. 112

Central Air Conditioning Units

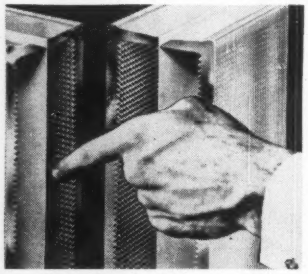
Two new central air conditioning units for light commercial and residential applications . . . . One unit, designed to match the manufacturer's "Highboy" oil or gas furnace, is available in 2 ton capacity. An inlet air opening is provided in the side panel for connection with a warm air furnace or with a return duct if no furnace is involved in the installation. The second unit is especially designed to be used with an oil fired or gas fired suspended furnace and is built in 2 and 3 ton sizes. Air circulation and filtering are provided by the furnace or by a separate blower if the unit is installed by itself. Both units may be ordered with either single phase or three-phase compressor motors.



Manufacturer—Iron Fireman Mfg. Co., 3170 W. 106th St., Cleveland 11.

Glass Blocks Reduce Heat, Glare

"Suntrol" hollow glass blocks added to line of double-cavity glass blocks for exterior walls and roofs . . . . The new blocks have a pale green fibrous glass filter sealed into their centers to reduce the glare and heat of the sun. The denseness of this screen plus the partial vacuums in the blocks provide good illumination with high insulation (*U* value 0.41), the manufacturer states. The double-cavity insulation is designed to reduce heating and air conditioning costs.

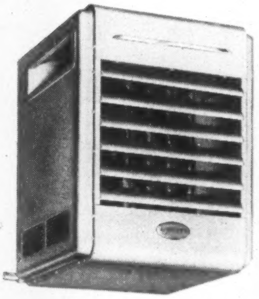


Manufacturer—Pittsburgh Corning Corp., 1 Gateway Center, Pittsburgh 22.

Non-Rising Stem Gate Valve

Non-rising stem gate valve . . . . Known as the "No. 616 Utility Pattern" gate valve,

added: new members to a famous line!



UTILITY'S UNIT HEATERS NOW IN 50,000 TO 225,000 BTU

You liked our 50 UF suspended unit heater so well when we introduced it last season, we've expanded the line to include 6 models in all. The 4 new ones are in capacities you've asked for—75, 100, 125 and 150 thousand BTU. This increased line assures you the right size for any unit heating job. All 4 have been compactly styled to follow the popular 50 UF design. The 225,000 BTU model retains its former highly accepted design for larger installations.

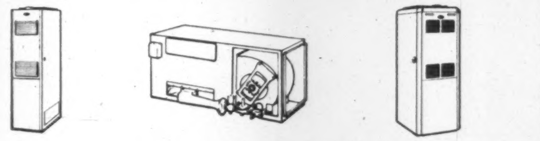
These attractive unit heaters offer the perfect solution to problem commercial installations where high heating power is needed, but where the heating unit must be handsome and compact.

Check these advantages: porcelain enameled heat exchangers; low 24-voltage controls; slow speed motor for whisper-quiet operation; high efficiency heat exchanger; pull-chain switch for summer ventilation; fully automatic; AGA-approved. You'll see why these competitively priced Utility Unit Heaters will help you sell the job and keep your customers happy!

UTILITY
TRADE MARK
Guaranteed heating performance

GAFFERS & SATTLER AND OCCIDENTAL
Automatic Gas Ranges
UTILITY
Furnaces • Air Conditioners
Air Coolers • Water Heaters

a happier living family tree . . . all branches of **UTILITY**



See the complete UTILITY heating and air conditioning line now

UTILITY APPLIANCE CORP., Dept. HPH-10
4851 S. Alameda St. • Los Angeles 58, Calif.

Please send me full information on:

☐ Utility Automatic Heating and Air Conditioning Equipment
☐ Utility Cooling Equipment
☐ Utility Automatic Gas Water Heaters

NAME__________
ADDRESS__________
CITY__________ ZONE____ STATE______

First All New pipe insulation in 60 years!

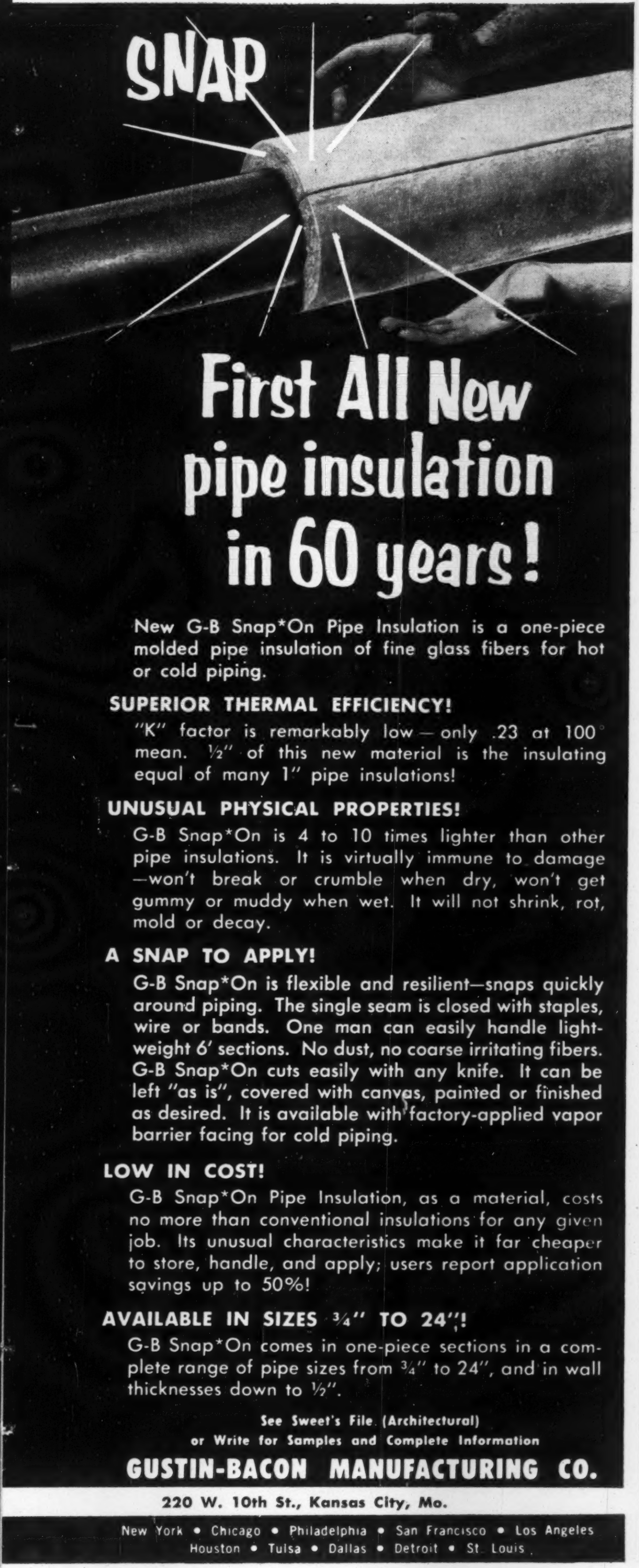
G-B SNAP*ON

PIPE INSULATION

One-piece molded pipe insulation of fine glass fibers

*Trademark Reg.

GUSTIN-BACON MANUFACTURING COMPANY



New G-B Snap*On Pipe Insulation is a one-piece molded pipe insulation of fine glass fibers for hot or cold piping.

SUPERIOR THERMAL EFFICIENCY!
"K" factor is remarkably low — only .23 at 100° mean. ½" of this new material is the insulating equal of many 1" pipe insulations!

UNUSUAL PHYSICAL PROPERTIES!
G-B Snap*On is 4 to 10 times lighter than other pipe insulations. It is virtually immune to damage —won't break or crumble when dry, won't get gummy or muddy when wet. It will not shrink, rot, mold or decay.

A SNAP TO APPLY!
G-B Snap*On is flexible and resilient—snaps quickly around piping. The single seam is closed with staples, wire or bands. One man can easily handle lightweight 6' sections. No dust, no coarse irritating fibers. G-B Snap*On cuts easily with any knife. It can be left "as is", covered with canvas, painted or finished as desired. It is available with factory-applied vapor barrier facing for cold piping.

LOW IN COST!
G-B Snap*On Pipe Insulation, as a material, costs no more than conventional insulations for any given job. Its unusual characteristics make it far cheaper to store, handle, and apply; users report application savings up to 50%!

AVAILABLE IN SIZES ¾" TO 24"!
G-B Snap*On comes in one-piece sections in a complete range of pipe sizes from ¾" to 24", and in wall thicknesses down to ½".

See Sweet's File (Architectural)
or Write for Samples and Complete Information

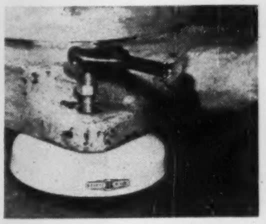
GUSTIN-BACON MANUFACTURING CO.
220 W. 10th St., Kansas City, Mo.
New York • Chicago • Philadelphia • San Francisco • Los Angeles
Houston • Tulsa • Dallas • Detroit • St. Louis

it is available in sizes ½, ¾, 1, 1¼, 1½ and 2 in. Construction is all bronze, with "Brite-Kote" finish and colored hand wheel. This valve, with full heavy stuffing box and wedge disc, is for steam, water, oil, air, vacuum or gas service up to 125 psi working steam pressure.

Manufacturer—Hammond Brass Works, Summer Blvd., Hammond, Ind.

Self Leveling Machinery Mounts

New and larger "Leveling Barrymount" designed to carry up to 10,000 lb per mount. . . . Called the "LM7," it allows heavy machinery to be installed and levelled in a matter of minutes without bolting or shims, the company states. According to the manufacturer, the mounts provide for greater mobility, less noise and absorption of vibration. The mount permits height adjustment for leveling up to ½ in. To level a machine, the bolts are adjusted with a hand-wrench until all four magazines are at the proper height.



Manufacturer—The Barry Corp., 765 Pleasant St., Watertown 72, Mass.

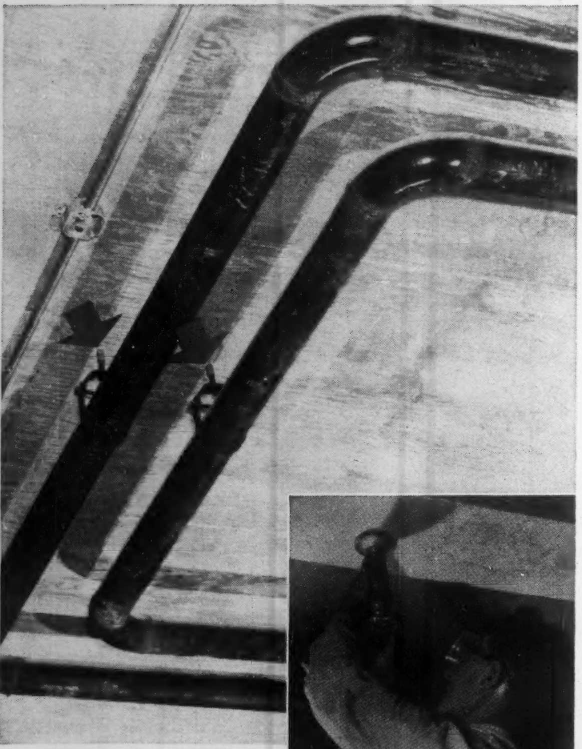
Steam Cleaner for Machinery

"Steam Kleen" jet sprayer for cleaning of motors, compressors, condensers, engines, etc., without dismantling. . . . Known as the "Mighty Midget No. 111", it is operated by finger tip control. Changeover from wet to dry steam is instantaneous and is accomplished by tilting the unit from horizontal to vertical position. It degreases as it cleans. The sprayer has a capacity of ½ gal of water and can be brought up to operating temperature and pressure in 20 min using cold water, the manufacturer states. The unit is electrically heated, thermostatically controlled and operates on any 110 and 115 volt circuit. It is fitted with a steam safety valve.

Manufacturer—Henry Flow Control Co., Melrose Park, Ill.

Circular Air Diffusers

Adjustable and non-adjustable circular air diffusers . . . . The adjustable units have built-in segmentized air controllers to produce any angle of discharge from above horizontal to vertical without disturbing the relative position of the spinnings. Four



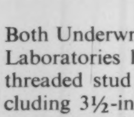
VELOCITY-POWER stud units

give you APPROVED holding

power for pipe hanging jobs

Both Underwriters' Laboratories and Factory Mutual Laboratories have approved Velocity Power ¼-inch threaded stud units for hanging pipe up to and including 3½-inch, and ⅜-inch stud units for pipe up to and including 5 inches in diameter. This approved holding power, *exclusive with Velocity Power stud units in the sizes indicated*, protects the quality of your job, and your reputation.

We'll be happy to tell you about these approvals in detail, and show you the many other features of the Velocity Power Driver that help you get more contracts, maintain profit levels, and do the job better, safer. Write for details.



There's no slow-down on those close-to-the-wall jobs. Spall-shield can be retracted, or a portion of the shield can be rotated out of the way. Quadrant marks provide accurate guide for stud installation.

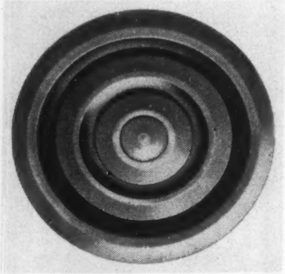
VELOCITY POWER TOOL COMPANY
201 North Braddock Avenue
Pittsburgh 8, Pa.

EQUIPMENT DEVELOPMENTS

Continued

90 deg segments, independently adjustable, permit horizontal blow from one segment, vertical from a second, 45 deg downward from a third and 20 deg from a fourth, if desired. Intermediate angles of discharge are maintained with or without ceiling effect.

All adjustments can be made after installation.

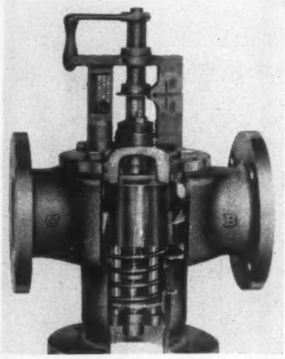


Aluminum spinnings are designed with a wide outer flange to overcome inaccuracies in plaster openings and minimize the need for smudge rings.

Manufacturer—Air Devices Inc., 185 Madison Ave., New York 16, N. Y.

Temperature Regulators

Temperature regulators containing a thermal element developed for use on internal combustion engines and other temperature control applications. . . . The regulators, "Nos. 1280 and 1281," contain a "Power-Pill" unit which is charged with a solid, wax-like compound. When subjected to heat the waxy compound melts and expands. The heated liquid returns to a solid state upon cooling. The regulators contain from one to four "Power-Pill" units depending on the sizes of the valves, which are available in sizes ranging from 2 to 6 in. Temperature settings are available in the range from 120 F to 190 F in 10 to 15 deg increments.



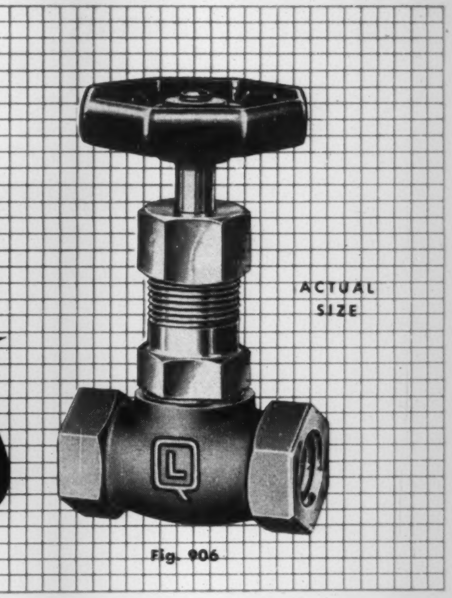
Manufacturer—Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville, Tenn.

Fire Resistant Insulation

Fire resistant 85 percent magnesia thermal pipe insulation . . . . The association states

NEW

LUNKENHEIMER QUARTER-INCH BRONZE NEEDLE VALVES



ACTUAL SIZE

Fig. 906

Solve your space problems!

INSTRUMENT BOARDS ARE CROWDED — and up until now, the size of needle valves installed behind instrument panels has been a serious problem. But this revolutionary new quarter-inch valve *saves as much as 20% in size* — yet is actually stronger than the conventional design.

LUNKENHEIMER

L

QUALITY

BRONZE . IRON . STEEL

It's safer, more accurate, and more compact — easier to install and maintain! The reason: the body of the new figure 906 is carefully machined out of a cast block of close-grained bronze. It gives you all three of the "most wanted" needle valve features — great strength, compact size, and absolute accuracy of flow control.

Figure 906 is available in a wide range of sizes and in both globe and angle patterns. The quarter-inch size, designed for instrumentation, is only 2¾ inches high — 1½ inches wide. Larger sizes, where bulk is not a problem, are comparable to conventional needle valves. In the globe design, you can take your choice of famous Stemalloy® bronze stems or cadmium-plated steel stems. All patterns have new gland followers and fine thread-pitch for close regulation.

FOR MORE INFORMATION, request Circular 568. Your Lunkenheimer Distributor has it, or you can write for a copy to The Lunkenheimer Company, Box 360N, Cincinnati 14, Ohio.

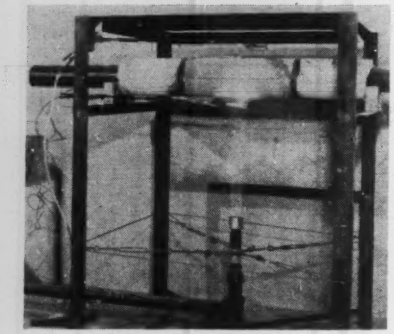
*Patented Alloy

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-153-23

that recent tests have shown that the material will withstand a 2000 F flame for an extended period with-

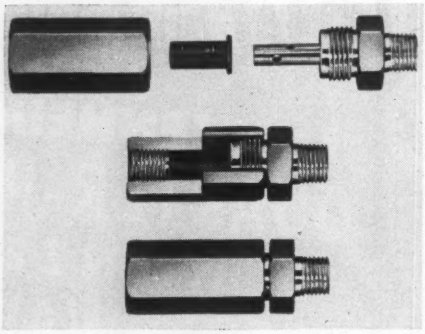


out appreciable damage, indicating that the insulation is capable of protecting pipes and equipment and their contents under average fire conditions. The tests were carried out with empty 6 ft lengths of 3 in. standard steel pipe covered with 1 in. of insulation. The pipe was supported horizontally in a test stand about 10 in. above the orifice of a burner firing a mixture of compressed air and manufactured gas.

Reported by—The Magnesia Insulation Manufacturers Association, 420 Lexington Ave., New York 17.

Check Valve

"Warren" check valve designed to provide maximum flow with low opening pressures and bubble-tight operation . . . . It consists of a two-piece metal body and a special composition sleeve, and has no seat and no spring. The manufacturer states that it is immune to vibration and may be mounted in any position.



Manufacturer—Betts Machine Co., 1800 Pennsylvania Ave., West, Warren, Pa.

Motor Base for Speed Drives

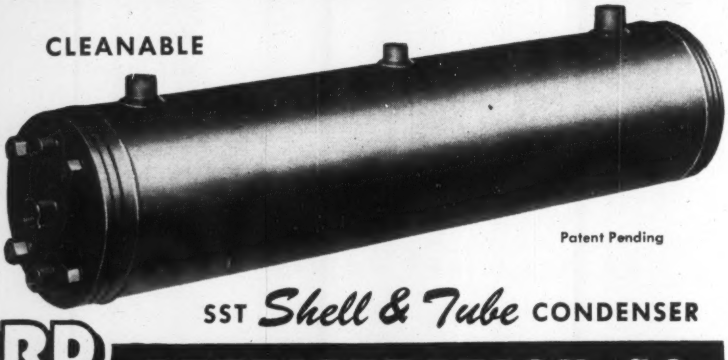
New motor base to permit easier adjustment of center distances for variable speed drives. . . . The "Quick-Slide" motor base has a pro-

STANDARD WATER-COOLED CONDENSERS... TESTED

and TESTED AGAIN BY TIME!

CLEANABLE

STANDARD manufactures a complete line of A.S.M.E. and U.L. Inspected Shell and Tube, Shell and Coil, Vertical and Counterflow Condensers specifically designed to meet the demand where space is limited.



SST *Shell & Tube* CONDENSER

Write for our Catalog #5154 today!

STANDARD REFRIGERATION CO.

3541 West Fillmore Street • Chicago 24, Illinois

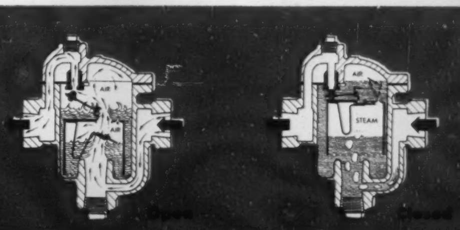
Manufacturers of CONDENSERS and RECEIVERS

NO OTHER STEAM TRAP

gives you all these features for Low Pressure Heating Service!

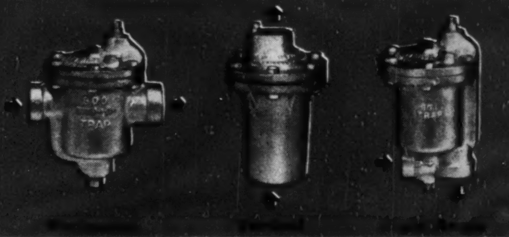
1.
QUICK HEATING

Use of a "blast" bucket with auxiliary thermic vent gives maximum air-handling capacity. Air and water blow straight through until steam closes vent.



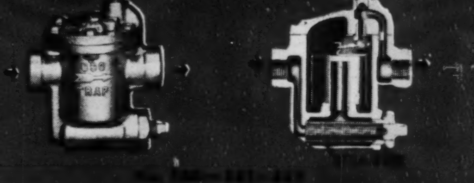
2.
EASY INSTALLATION

Any pipe connection—horizontal, vertical or angle—available for the majority of installations to save time, labor and fittings.



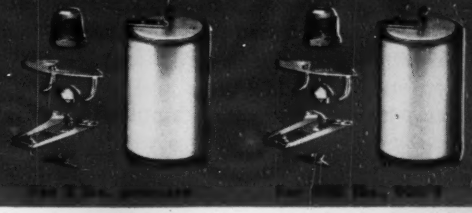
3.
INTEGRAL STRAINER

The three most commonly used trap sizes are available with strainers built-in to the body to save time, labor and money through faster installation with fewer fittings.



4.
STAINLESS MECHANISM

Valve and seat of hardened chrome steel, all other parts 18-8 stainless—*identical* to materials and workmanship used in traps for 900 lbs., 900°F.

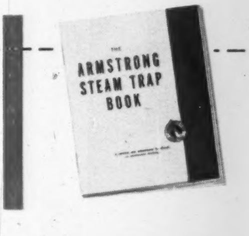


Dependable . . . Guaranteed Performance . . .

Self-scrubbing . . . Non Air Binding . . . Immune to Corrosion.

Traps and Parts in Stock in Over 100 Cities. Call your nearby Armstrong Representative or Jobber Today.

ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Michigan



Send for Catalog

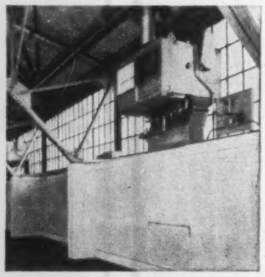
—the Armstrong Steam Trap Book gives complete data and prices, tells what size trap to use.

ARMSTRONG STEAM TRAPS

HEATING PROBLEM:
How to dangle Navy Pier into icy Lake Michigan and still keep it warm.
THE SOLUTION:
Janitrol
GAS-FIRED UNIT HEATERS

This exhibit hall required enough heat for 480 average homes during large winter conventions! The same heating system had to quickly modulate for smaller exhibits and also provide summer ventilation. In 1936, Janitrol Gas-Fired Unit Heaters were specified and today 117 units are performing with minimum maintenance and complete satisfaction.

For heating that's engineered to your job, check Janitrol. For more information, write for "Businessman's Blue Book of Better Heating".



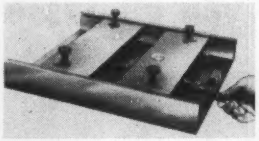
Twin Janitrol Unit Heaters, placed overhead along the outer walls of Navy Pier, heat and circulate 5,800 cubic feet of air per minute!

Janitrol
GAS-FIRED UNIT HEATERS

Janitrol Heating
& Air Conditioning Division
Surface Combustion Corporation
Columbus 16, Ohio
In Canada: Alvar Simpson Ltd.
Toronto 13

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES *Kathabar* HUMIDITY CONDITIONING

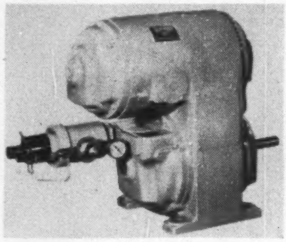
vision for releasing the adjusting screw which permits the motor to be moved freely and quickly after the base is bolted down.



Manufacturer—T. B. Wood's Sons, 1275 Fifth Ave., Chambersburg, Pa.

Variable Speed Transmission Control

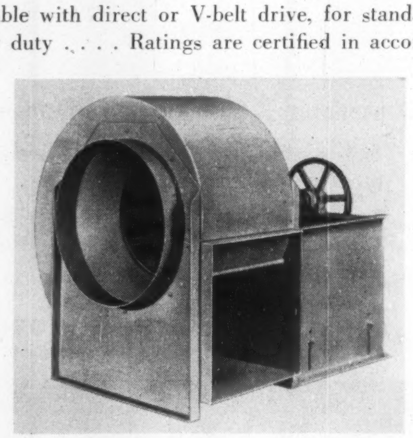
Pneumatic control for the "Speed-Trol" variable speed transmission . . . . The "Conoflow" pneumatic control utilizes a "Cono" motor and provides an automatically controlled drive for processing operations involving variables such as pressure, temperature, liquid level, proportional flow and control of rewind. The control is available in both manual and automatic types sensitive to electric, mechanical or pressure signals.



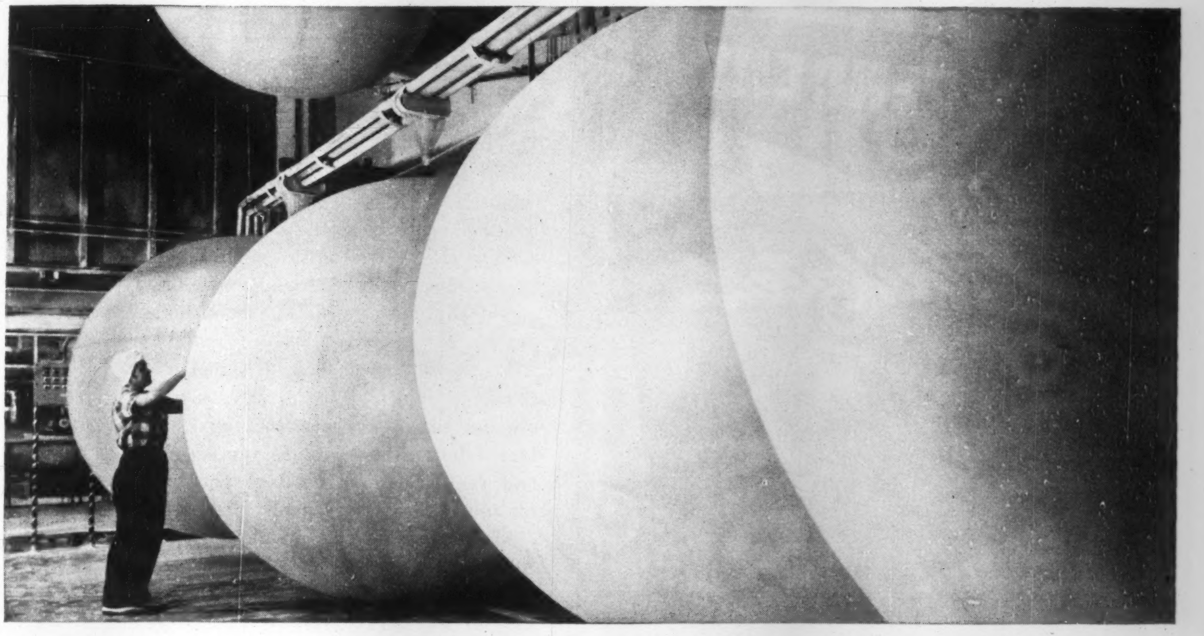
Manufacturer—Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22.

Large Volume Fans

Large volume Type "MD" fans, available with direct or V-belt drive, for standard or heavy duty . . . . Ratings are certified in accordance with the standard test code jointly adopted by the NAFM and the ASHVE.



Housings and bases are extra heavy sheet steel with



WEATHER BALLOON MAKER SAVES $2500 A YEAR WITH KATHABAR EQUIPMENT

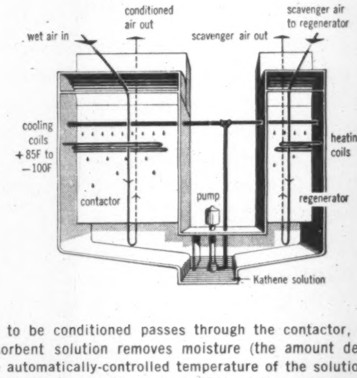
Kathabar humidity conditioning provides the right weather for making weather balloons. The Dewey and Almy Chemical Company obtains 40-grain air without frost, expensive over-cooling and re-heating, or duplicate coils. The system's coolant is 75°F water. *Results:* annual saving of $2500 in operating costs—and faster production of their balloons.

Here's how their two-zone system works. In the first zone, ground level, latex balloon gels are inflated from one-fourth to full size. Moisture between latex particles is a necessary lubricant during gel inflation. The maintained air conditions average 70°F, 50% RH.

Second zone, an 80-foot drying tower, is held at 100°F and 20-30% RH for final drying. The moisture must be removed at a controlled rate—not too fast or the balloons rupture; not too slow or production is impeded. Temperatures over 100°F would cause a spotty pre-cure.

This is a typical example of how Kathabar humidity conditioning has solved industrial air conditioning problems for 20 years. Your Kathabar system representative can show you how to dictate *your* production weather. As a trial balloon, write for Literature Group K54-2.

WHAT COULD BE SIMPLER?



Air to be conditioned passes through the contactor, where an absorbent solution removes moisture (the amount depends on the automatically-controlled temperature of the solution). In the automatic regeneration, about 15% of the solution is heated, and the moisture it releases is blown out the window.

Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF **Surface** INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING

INDEPENDENT

"Fabrikated"

REG. U. S. PAT. OFFICE

AIR CONDITIONING REGISTERS

No. 321-A HMV Tandem

Each front grille bar may be adjusted individually. As a result, the angles of deflection or combinations of grille bar adjustment are unlimited. These adjustments may be made when register is installed or at any later time desired. The valves in Independent HMV registers are readily set by a lever control located on the front to direct the air up or down, or the valves may be fully closed. Available in a number of small and large sizes.

Always Leading—Always Progressing

MEMBER
NATIONAL WARM AIR HEATING
INDOOR COMFORT
AND AIR CONDITIONING ASSOCIATION

THE INDEPENDENT REGISTER CO.
3747 E. 93rd STREET • CLEVELAND, OHIO

continuous welded seams. Streamlined fan inlets are designed for high efficiency and low operating noise. The fans can be supplied with six different acid resistant coatings to meet "any acid or corrosive fume condition."

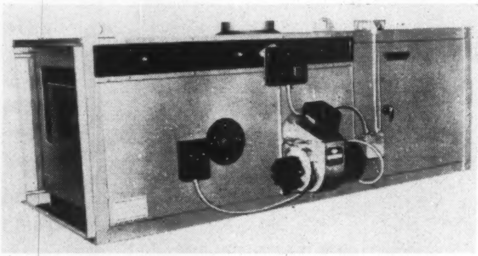
The V-belt driven fans are furnished with a forward curved wheel in all standard duty types and with a backward curved wheel in all heavy duty types. Wheels are of all-welded construction and both statically and dynamically balanced.

The direct drive fan, with a forward curved wheel, is recommended by the manufacturer for commercial use, for exhausting kitchen odors, supplying air for forced draft in boiler rooms, ventilating public garages, and ventilating and cooling. The belt-driven fan is for use in hospitals, schools, apartment buildings, etc.

Manufacturer—Chicago Blower Corp., 9867 Pacific Ave., Franklin Park, Ill.

Oil Fired Suspension Furnace

Addition of new oil fired 196,000 Btu output suspension furnace to manufacturer's suspension series. . . . Revised internal design of the "01-245-S19" features the absence of internal baffling and the ability to clean out the heat exchanger area without removing the burner or wiring. Other features include accessibility to the blower compartment from both sides, consolidation of the wiring harness, and a bottom horizontal discharge blower designed to pass a maximum amount of air over the primary surface of the heat exchanger. The unit is shipped complete with burner, blower, motor and controls.



Manufacturer—Jackson & Church Co., 321 N. Hamilton Ave., Saginaw 65, Mich.

Multi-Blade Dampers

"Damperset" hardware designed for multi-blade dampers, either parallel or opposed . . . . The manufacturer has been licensed by Minneapolis-Honeywell Regulator Co. to manufacture and distribute the hardware. Each complete parallel blade set consists of one bracket and brass pivot pin, two bearing pins and straps, two self-oiling bronze bushings and three set screws. The company states that "Damperset" construction is automatically self-aligning,

# 4 GOOD REASONS
for specifying
Watson-Stillman
Forged Steel Fittings

Here's why **W-S FORGED STEEL FITTINGS** mean safe, dependable operation of your piping system:

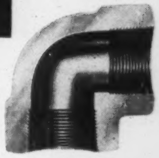
1. They're *drop-forged* to produce the well-known forged fiber structure with exceptionally high tensile and impact strength.
2. They're "Safety-Factor" designed with heavy walls where you need them. Extra long bands extend well beyond the last thread.
3. They're precision machined. Special automatic angle indexing machines maintain precise angular accuracy for perfect alignment. Long accurate threads insure tight joints.
4. They're fully inspected. Gauges double-check the close tolerances, angularity, threads and sockets and concentricity.

WATSON-STILLMAN FORGED STEEL FITTINGS give you maximum resistance to pressure, temperature, corrosion, shock and vibration. They protect your system against costly shut-downs.

A complete line of forged fittings available in both SCREW-END and SOCKET-WELDING types in carbon, stainless and alloy steels. Write today for information.

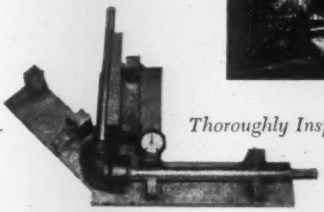
Sold Through Leading Distributors

Drop Forged for Strength



"Safety-Factor" Design

Precision Machined



Thoroughly Inspected

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey

THIS RUNDEL-BUILT VARIABLE VOLTAGE CONTROL PANEL is designed for controlling three motors, each with five selective speeds. Major components include Ward Leonard A-C and D-C contactors, starters, relays and resistors.

Photo courtesy Rundel Electric Co., San Francisco, Calif.

It's here...
one-stop shopping
FOR
control components

Whether you're building, buying, or using controls, you'll find every A.C. or D.C. component you need at Ward Leonard.

That includes components for automation control, processing machinery, variable voltage speed control (Ward Leonard System of Control), machine tool control, conveyor system, air conditioning and other controls.

Here's what one-stop shopping at Ward Leonard gives you:

- Coordinated design gives matched performance between components.
- Quality-controlled manufacture assures uniformly excellent performance of each component.
- Broad selection cuts shopping headaches, time, costs.
- Ward Leonard design minimizes required panel size.
- Ward Leonard design simplifies engineering requirements.

A Ward Leonard engineer will be glad to show you our complete line of coordinated components for your control application. Or write for control catalog to Ward Leonard Electric Co., 24 South St., Mount Vernon, New York.

5 major control components make W. L. line complete

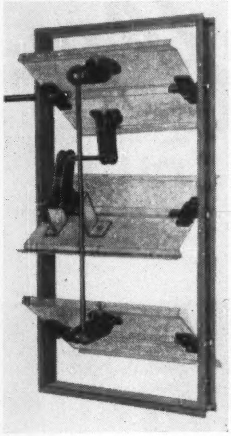
1. A.C. and D.C. CONTACTORS — solenoid type, multi-pole, wide range of accessories.
2. A.C. and D.C. MAGNETIC RELAYS — standard and specialty types like vibrating field, field loss, anti-plugging, etc.
3. A.C. STARTERS — Manual and magnetic, full or reduced voltage, single- or multi-speed.
4. RHEOSTATS — Ring, plate and face plate types, manual or motor driven.
5. RESISTORS — Low, medium or high current for control circuit, motor starting, etc.

WARD LEONARD
ELECTRIC COMPANY
MOUNT VERNON, NEW YORK

RHEOSTATS | RESISTORS | RELAYS | MOTOR CONTROLS | DIMMERS | CHECKMASTER

Result-Engineered Controls Since 1892

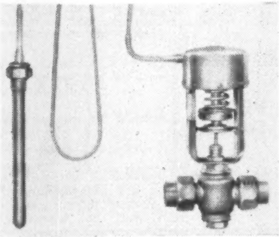
provides for variable blade adjustments and permits either manual or motorized operation.



Manufacturer — Elgen Mfg. Corp., 41-34 39th St., Long Island City 4, N.Y.

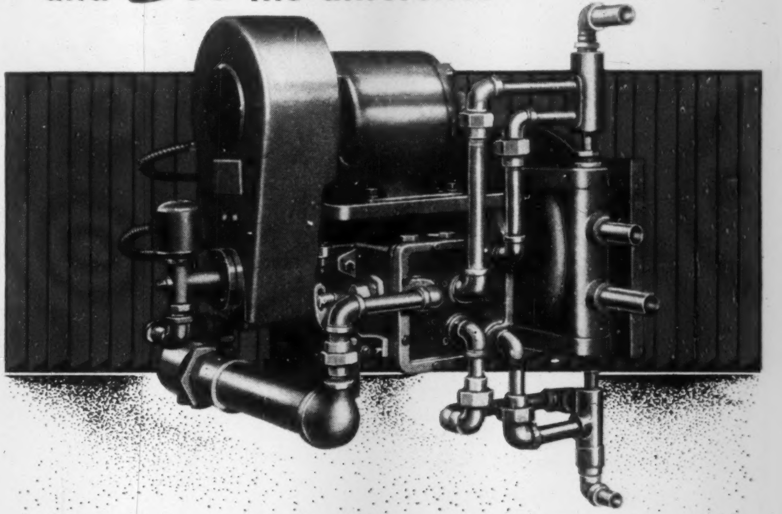
Temperature Regulator

Industrial temperature regulator, the "No. 999," used to control the temperature of internal combustion engines, storage water heaters, etc. The manufacturer's statisticians have calculated that there are 24,640 possible standard combinations of the regulator. It is self-powered and is designed so that it requires no compressed air, electricity or other outside source of energy. A large, two-ply, seamless metal sylphon bellows provides long life, the manufacturer states. Over-temperature protection is a standard feature.



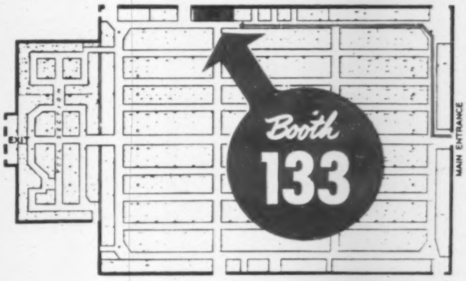
Manufacturer — Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville 1, Tenn.

at the Power Show . . .
look at SUPERIOR ROTARY BURNERS
and See the difference



HERE'S WHAT TO LOOK FOR:

- Time-tested horizontal-rotary design.
- V-Belt Drive for the high cup speed essential to efficient atomization.
- Four-Hole Hinge circulates oil through oil heater so that hot oil is on the *pressure* side of the pump, allowing you to burn oil at higher temperatures.
- Adjustable Air Nozzle provides accurate control of flame contour.
- Dual Pumps and Reservoir combined with Constant Oil Rate Control provide controlled firing regardless of viscosity variation.
- Burn any grade of oil. Also available with combined gas burner for any type of gas.
- Fully automatic in sizes to 500 bhp with dual ignition, and hi-low or fully modulating control.



POWER SHOW
DEC. 2 thru 7, 1954
BOOTH 133
COMMERCIAL MUSEUM
PHILADELPHIA

If you're not going to the show, write for Catalog 1604

for performance you can BANK on

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

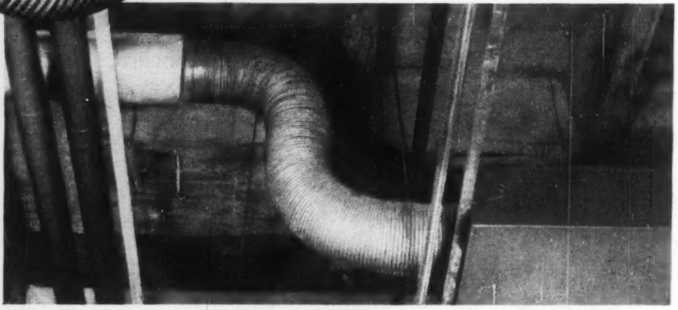
SUPERIOR ROTARY BURNERS

Now you can save 25%—32% on air conditioning installations with *Thermaflex*:® DUCT

Here's why Thermaflex is better:

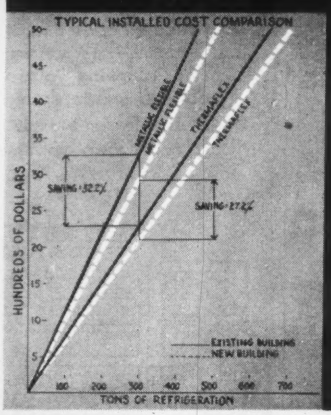
Thermaflex has been designed exclusively for use as a cost-saving connector from either vertical or horizontal main line ducts to diffusers, sound boxes, and/or other types of distributors in both high- and low-pressure air conditioning systems.

1. **Light in Weight**—Thermaflex is exceptionally light in weight . . . easy to handle.
2. **Maximum Flexibility** — Thermaflex snakes around obstructions . . . takes close bends with a radius equal to half its own diameter. Eliminates misalignment problems between main line and sound box or diffuser.
3. **Easy to Install** — No special skill or training needed for the installation of Thermaflex. Lengths can be easily carried up ladders and cut to size using only a pocketknife and diagonal side cutters. No special fittings required . . . slips easily in place for airtight service.
4. **Flameproof — Waterproof** — Due to the unique construction of Thermaflex, it is highly flame resistant, will not support combustion, and is completely impervious to the effects of moisture, rust, rot, fungus and mildew.
5. **Reduces Vibration — Deadens Noise** — Thermaflex reduces mechanical noises in the line due to vibration. Its unique acoustical features also dampen air-stream noises. This is particularly important for low-pressure systems where connections are made directly from main line to diffuser.
6. **Excellent Air Flow Characteristics** — Thermaflex has excellent air flow characteristics with minimum friction loss in bends.
7. **Adaptability** — Thermaflex is available in a wide variety of diameters, 3″ to 12″, in standard 12 foot lengths.



Thermaflex bends easily to fit any installation

HERE'S PROOF



TYPICAL
INSTALLED COST
COMPARISON

1000 TONS NEW BLDG.	COST	SAVINGS	
RIGID METAL	8,960.⁰⁰		
		7½%	30%
METALLIC FLEXIBLE	8,300.⁰⁰		
		25%	
THERMAFLEX	6,225.⁰⁰		

THERE'S AN AGENT NEAR YOU

Write for fully illustrated brochure describing Thermaflex. Address Department HPAC

Flexible Tubing
CORPORATION

Guilford, Connecticut
Pasadena 1, California

SEE THERMAFLEX ON DISPLAY

Visit our booth #C-156 at the International Heating & Ventilating Exposition, Commercial Museum & Convention Hall Philadelphia, Pa. January 24 to 28, 1955

YOUR *Thermaflex:* AGENT IS LISTED HERE

Avery Products Company
1908 Euclid Avenue
Cleveland, Ohio

Bensen & Stafford
1961 St. Anthony Avenue
St. Paul 4, Minnesota

George F. Bertrand Company
101 North 33 Street
Philadelphia 4, Pennsylvania

Howard V. Caton Company
Post Office Box 4126 (1425 Elizabeth Avenue)
Charlotte, North Carolina

The Robert B. Darling Company
207 East 37th Street
New York 16, New York

Jack Thomas Davis
Room 211, 3303 Montrose Boulevard
Houston 6, Texas

Graves Refrigeration, Inc.
254 Boulevard, N. E.
Atlanta 5, Georgia

V. N. Harwood Company
250 Delaware Avenue
Buffalo 2, New York

Heaven Engineering Company
1529 Wyandotte
Kansas City 8, Missouri

Hyland Engineering Sales
623 Architects & Builders Building
Indianapolis 4, Indiana

The Leonhardt Company
89 Pond Avenue
Brookline, Massachusetts

J. C. Lewis Company
209-211 East Markham Street
Little Rock, Arkansas

W. E. Lewis & Company
2213 Butler
Dallas, Texas

McCombs Supply Company
322 First Street N. W.
Albuquerque, New Mexico

The McCombs Supply Company
1524 15th Street
Denver, Colorado

Ogle Engineering Sales
P. O. Box 74
St. Matthews, Kentucky

Gus W. Otter Sales, Inc.
565 First National Bank & Trust Building
Oklahoma City, Oklahoma

L. S. Pawkett & Company
816 Insurance Building
San Antonio, Texas

Mr. Joseph G. Stalb
P. O. Box 51
Ridgefield, Connecticut

G. V. Sutfin Company
P. O. Box 43
Western Hills Station
Cincinnati 38, Ohio

Syracuse General Sales Company
205 Townsend Street
Syracuse 2, New York

Ward & Black Engineering Sales
822 Chapel Way
Pittsburgh 33, Pennsylvania

F. B. Wright Company
1565 Oakman Boulevard
Detroit, Michigan

Norman S. Wright & Company
2779 Folsom Street
San Francisco 10, California

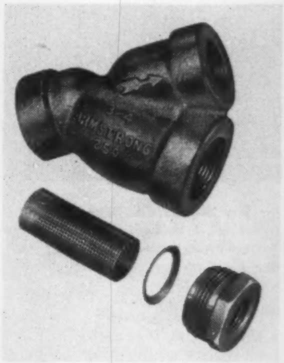
George V. Zintel Company
840 North Michigan Avenue
Chicago 11, Illinois

EQUIPMENT DEVELOPMENTS

Continued

Y-Type Pipe Strainers

Features designed to minimize maintenance are incorporated in new line of cast semi-steel Y-type pipe strainers . . . . The strainers are for use in steam, air, water, oil and gas lines at pressures to 250 psi. There are eight sizes from ¼ through 2 in.



Manufacturer — Armstrong Machine Works, 874 Maple St., Three Rivers, Mich.

Submersible Sump Pump

Lightweight submersible sump pump designed for operation in and under water and for portable or permanent installation . . . . The 1¼ in. IPS outlet permits a discharge capacity of up to 3200 gph against a head of 5 ft.

Manufacturer — Radiant Utilities Corp., 8817 18th Ave., Brooklyn 14.

FURNAS ELECTRIC

Magnetic Starters

Your most complete selection in the 1-50 hp range

NEW "IN-BETWEEN" SIZES SAVE ON COSTS AND UP TO 40% IN SPACE

Why Pay for Starter Capacity You Never Use? Now you can select the exact starter size matched to any application in the 1-50 hp range from the nine Furnas Electric sizes. Many in-between sizes can save you money and conserve space. Immediate delivery from stock.

Same Service, Less Money—Here's an example of how you can save: Suppose you want a starter for 10 hp service. It's no longer necessary to select a size 2 rated 25 hp. You save in cost and up to 40% in space by selecting a Furnas Electric type YE, the right starter for the job.

Important Features—1. Dual voltage coils matched to your motor. 2. Four-speed thermal overload protection. 3. Easy installation and wiring in shallow case. 4. Heavy contacts for long life.

Complete Range of Other Products—Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

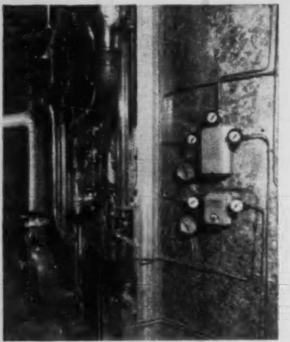
Write today for Bulletin No. 5402, giving the full story. Furnas Electric Company, 1041 McKee Street, Batavia, Illinois.

FURNAS ELECTRIC
Batavia, Illinois

for All-Weather Comfort
FINE STORES depend on
JOHNSON CONTROL

The Denver Dry Goods Co., Cherry Creek Store, Denver, Colorado. T. H. Buell & Co., architects and engineers; Denver Plumbing & Heating Co., heating, ventilating and air conditioning contractor, both of Denver.

Shoppers move in perfect comfort throughout this spacious store. Strategically located Johnson Room Thermostats maintain refreshing, even temperatures regardless of outside weather or occupancy conditions.



Temperature of the cool air plenum of this unit is controlled by a Johnson T-800 Capillary Thermostat, while a T-901 Submaster Thermostat, controlling a V-103 Steam Valve on the heating coil, regulates the temperature of the warm air plenum.

Johnson D-251 Damper Operators, controlled by T-400 Thermostats in the store, regulate Mixing Dampers on each of four central fan air conditioning units.

There's made-to-order climate for shoppers in The Denver Dry Goods Co.'s new branch store at Denver's Cherry Creek Shopping Center.

With Johnson Control in command, the heating and air conditioning systems are under complete and precise control at all times. Johnson Room Thermostats at key locations maintain uniform, refreshing temperatures throughout the store by controlling the supply of conditioned air from four large central fan air conditioning units. Other Johnson Thermostats regulate Johnson Valves on the baseboard radiation heating system.

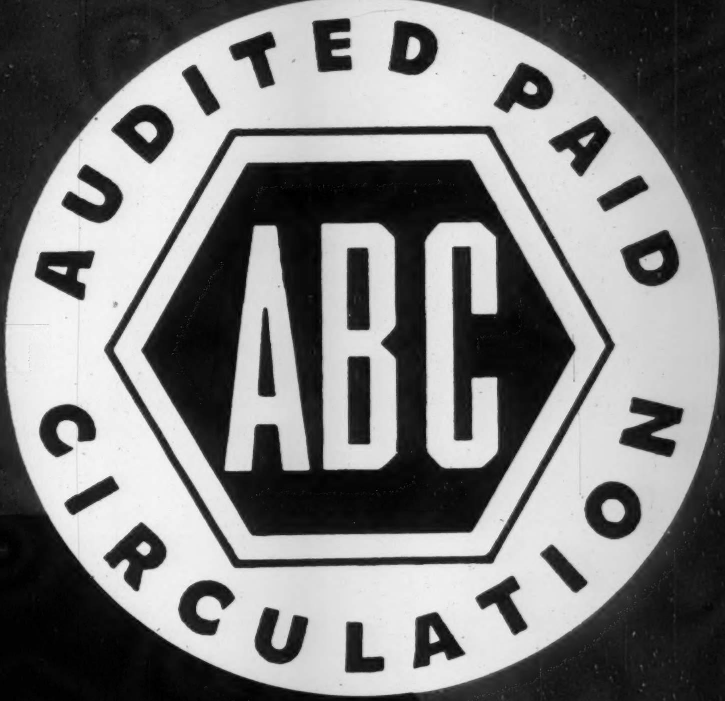
Behind the scenes, Johnson Master-Submaster Control maintains the correct relationship between the outdoor temperature and the temperature of the warm air plenums. The response is so perfect that the need for more or less heat is *never* felt *inside* the store. All Johnson apparatus is combined in one "Planned-for-the-Purpose" system that insures the desired results at the lowest possible cost.

Every Johnson System is designed to meet the exact needs of the individual installation. That is why you will find Johnson Control not only in leading stores, but in every type of public, commercial and industrial building. Next time you have a temperature control problem, remember, the nearly 70 years' experience of the nationwide Johnson organization is at your disposal without obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON CONTROL

TEMPERATURE ⇅ AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885


AUDITED PAID
ABC
CIRCULATION

What does this symbol mean to you?

AUDITED PAID ABC CIRCULATION

THIS INSIGNE ON 2692 MASTHEADS...

2692 periodicals and newspapers in the United States and Canada can proudly display the A.B.C. insigne on their mastheads. It means, "We're members of the Audit Bureau of Circulations!"

369 specialized business publications currently are qualified under A.B.C.'s high standards to carry the **Hallmark of Circulation Value.** Only these business publications can offer advertisers A.B.C. audited, paid circulation (indication of *voluntary* reader endorsement and resulting advertising value). Like all A.B.C. publisher members, they are pledged to keep true and correct records of circulation; to open all books and records for scrutiny by one or more of A.B.C.'s 65 trained circulation field auditors.

MEANS "MEMBER OF A. B. C.!"...

Nonprofit A.B.C. is unique in organization. The Bureau's 3575 members pay all costs and elect twenty-seven Directors to guide Bureau policy. Yet publisher members, paying 91.5% of total expense, give the majority voice in A.B.C. affairs to the four advertising agency and eleven advertiser directors who represent buyers of space.

For forty years the Audit Bureau of Circulations has been a voluntary, cooperative bureau of circulation standards serving advertisers, advertising agencies and publishers. Before 1914, no independent circulation yardstick existed; in 1954 there is no stricter test of circulation value than A.B.C. membership.

PROCLAIMS FACTS, NOT OPINIONS!

A.B.C. rules, bylaws and procedures have one purpose . . . the determination of net paid circulation facts for buyers and sellers of advertising. Upon this basis A.B.C. issues standardized statements of the circulation of publisher members, verifies the figures shown in these statements by auditor's examination, and disseminates circulation data. A.B.C. functions solely where accurate audits are possible; its reports contain no opinions or conclusions.

A. B. C. PROBES IN DEPTH!

ABC
REPORTS

Every business publication A.B.C. Audit Report is packed with audited answers to such important questions as: • How much *net paid* circulation? • How much *unpaid* distribution • What are the businesses and occupations of the subscribers? • Where are subscribers located? • What do subscribers pay? • Are premiums used to get subscribers? • Are subscribers in arrears? • What's the renewal percentage?

AUDITED PAID
ABC
CIRCULATION

● THE READER IS BOSS!

The A.B.C. insigne is evidence that to the editor of an A.B.C. business publication, the reader is boss. To attract new subscribers, to produce renewals in good measure, the editor must give readers the benefits of steadily improved editorial value.

The editor knows that a Bureau field auditor will call every year . . . to inventory subscriber response and to sum up the solid numerical facts about the circulation progress of his publication.

And, when an editor studies his A.B.C. audit report, he finds verified data that tells him whether or not he has earned the cash ballots—paid subscriptions and paid renewals—that reward editorial initiative and leadership.

● THE ADVERTISER BENEFITS!

Advertisers to industry, merchandising firms, institutions and professions seek interested buyers in *specific* markets for their goods and services.

Every paragraph in an A.B.C. business publication report gives such advertisers data valuable for the intelligent application of media to their chosen markets. Paragraph 10, telling them the business or occupation of a publication's subscribers, exemplifies the revealing A.B.C.-audited facts they need to build sound marketing plans, or create productive copy appeals. Because A.B.C. exists, specialized advertising appeals can go to clearly identified markets, through audited, paid circulation.

● THE PUBLISHER IMPROVES HIS PRODUCT!

A.B.C. membership brings to business publishers a solid source of exact circulation counts that meet impartial, generally accepted standards. A.B.C. business publications thus win the *attention* and *confidence* of advertisers and agencies.

Publishers benefit in many other ways from known A.B.C.-audited circulation. They can set equitable rates. They can identify the circulation characteristics that make their publication distinctive; build the type of audited, paid circulation their advertisers want.

● A. B. C. STRENGTHENS A FREE PRESS!

The Bureau is our outstanding example of business self-regulation by buyers and sellers under free enterprise. A.B.C.'s known standards and factual reports have changed publication advertising from speculative adventure to scientific investment in sales. Subscribers who pay to read, together with business men who invest in advertising help to bring to American and Canadian publications the income that keeps them free;—self-reliant contributors to our industrial growth and high living standards.

AUDITED PAID CIRCULATION

ABC

A. B. C. FACTS MEASURE ADVERTISING VALUE

For forty years the Bureau has limited itself to reporting facts, without opinion. "Every single rule, regulation, practice and procedure . . . is designed to develop for the publisher and for the advertiser an audited figure of paid circulation."

In its Fortieth Anniversary Year the A.B.C. insigne is advertising's **Hallmark of Circulation Value**—a dependable guide to the selection and use of business publications, magazines, farm publications and newspapers as advertising media. Buyer and seller unity in such successful business self-regulation, in 1954 as in 1914, makes A.B.C. a sound answer to industry's need for impartial circulation fact-finding and fact-reporting.

AUDIT BUREAU OF CIRCULATIONS
123 North Wacker Drive Chicago 6, Illinois

1914 • A.B.C. • 1954

GUARDIAN OF CIRCULATION INTEGRITY FOR 40 YEARS

WE HEAR THAT . . .

▶ Twenty-seven specialists in automatic controls from 20 *MINNEAPOLIS-HONEYWELL REGULATOR CO.* branch offices and factories have graduated from an advanced service and installation school in the firm's home office in Minneapolis. Instruction was given on the principles, design, installation and maintenance of automatic temperature regulating devices for heating, ventilating and air conditioning in commercial buildings.

▶ A commercial and residential packaged air conditioning division has been established by *MITCHELL MFG. CO.* to manufacture larger size units ranging from 2 to 15 hp. *ROBERT H. LODGE* is sales manager for the new division.

▶ *UNITED CORK CO.s* have acquired facilities in Wilmington, Del. for the production of cork pipe covering and cork fitting covers.

▶ *COOLIDGE-LOCHER CO.*, Carrier air conditioning sales and service firm in Corpus Christi, Tex., is celebrating its 25th anniversary this year. According to *D. E. LOCHER*, president, the company is one of the oldest in the Southwest.

▶ *FILTREX CORP.*, with offices and plant at 33-40 127th Pl., Corona, N. Y., has been formed to manufacture a new type of replaceable glass fiber filter for commercial and residential heating and air conditioning. The firm has developed a special process to make glass fiber soft and pliable to eliminate danger of glass splinters circulating through the air stream.

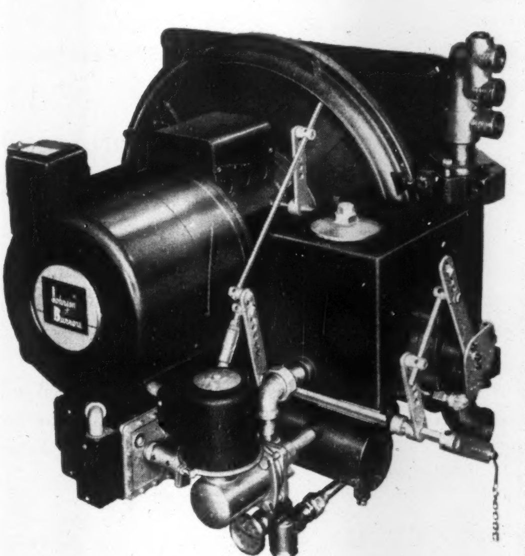
▶ The *CELOTEX CORP.* will build a new and larger gypsum board mill and will expand its other facilities at its Port Clinton, Ohio plant.

▶ *CURTIS MFG. CO.* is celebrating its 100th anniversary this year.

▶ Enrollment was twice as high as expected when the *UTILITIES ENGINEERING INSTITUTE* in Chicago reopened its air conditioning and refrigeration school this fall after four years of inactivity.

▶ A group of refrigeration and air conditioning contractors of Pittsburgh met recently to form a local RACCA and to file their application for affiliation with the national *REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOCIATION.*

Now you can have smooth, automatic "Cold Starts" regardless of Temperature and Viscosity variations!



THE REVOLUTIONARY NEW

JOHNSON

MODEL 53

built with a

POSITIVE DISPLACEMENT METERING PUMP

Here, for the first time, is a heavy-duty burner that will give you smooth, sure, automatic starts after shut-downs, when the oil in storage tank and lines is cold and hard to pump. More successfully than ever before, the new Johnson "Fifty-three" has solved the problem of "Cold Starts".

Built with a positive-displacement Metering Pump . . . a 3-Way Magnetic Oil Valve . . . and a high efficiency Suction Pump, the "Fifty-three" will maintain a fixed air-fuel-ratio regardless of variations in oil temperature and viscosity. It will start up and operate automatically on colder oils than any other burner on the market.

It is available in 8 sizes, from 25 HP to 400 HP. It brings you all the efficiency, economy, and fine engineering that have made Johnson Burners famous all over the world. It's surprisingly easy to service, inspect and regulate. All working parts are readily accessible. Make it a point to investigate the performance of this revolutionary new burner. We'll gladly send you full information.

Johnson Oil Burners

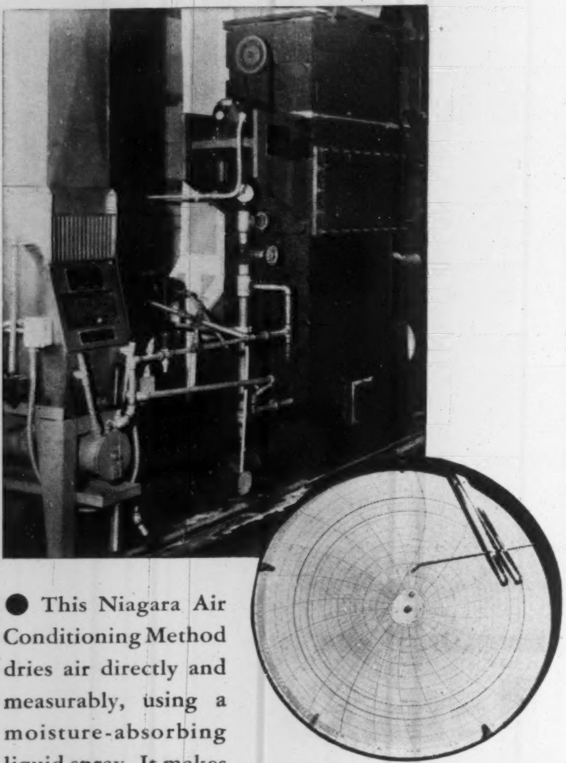
S. T. JOHNSON CO.
940 Arlington Ave., Oakland 8, Calif.
Church Road, Bridgeport, Pennsylvania

Builders of fine Oil Burner Equipment since 1903

EXACT CONTROL

of Moisture Content

To Improve Your Product
or Protect Your Materials
or for Processes or Tests



● This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and gives you precise control with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control installations have the best record for reliability.

Niagara Air Conditioning provides you with any temperature and relative humidity you need. Using "Hygrol" absorbent, it is not expensive to operate, saving the refrigeration commonly used to condense moisture and making re-heat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment. Ask for Descriptive Bulletins #112 and #121. Address Dept.— HP

NIAGARA BLOWER COMPANY

405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

WE HEAR THAT

Continued

▶ "Dust-Magnet," an electrostatic filter for air conditioners built for and introduced nationally this year by Hotpoint Co., will go into increased production by *STODDARD INDUSTRIES, INC.*

▶ The *A. M. BYERS CO.* has been accepted for membership in the *BUILDING RESEARCH INSTITUTE. B. M. BYERS*, vice president of the firm, is the official representative to the Institute.

▶ The Chicago office of *YARNALL-WARING CO.* has been moved to larger quarters at Room 308, Machinery Hall Bldg., 549 W. Washington St. The company has also announced the appointments of *MITCHELL CARSON, RAY PETERSON*, and *GORDON WAGNER* to the Chicago sales staff.

▶ Construction was started recently on *JONES & LAUGHLIN STEEL CORP.'s* new research center. The buildings will be air conditioned and will house many of the latest research instruments.

▶ *KAISER ALUMINUM & CHEMICAL CORP.* will build a new multi-million dollar aluminum sheet and foil rolling mill near Ravenswood, W. Va. The new plant will be the company's third fabricating plant in the east and middlewest.

▶ Ground has been broken for a $1,500,000 addition to the plant facilities of *VERSON ALLSTEEL PRESS CO.* This is the most recent and largest in a series of expansion moves begun in 1946.

▶ The entire capital stock of the *SHEET ALUMINUM CORP.* has been acquired by the *MUELLER BRASS CO.* It will be operated as a wholly-owned subsidiary.

▶ *PITTSBURGH PLATE GLASS CO.* is planning to construct a plate glass producing plant at Cumberland, Md. Estimated cost of the plant is $34 million.

▶ *RATEONICS CORP.* is establishing divisional offices in New York City. The firm specializes in audits of utility charges to effect savings for business firms and industries.

▶ *OTTO H. YORK, INC.* has moved its offices to new and larger quarters at 6 Central Ave., West Orange, N. J.

▶ Dealers and company officials of *CULLIGAN, INC.* met recently to discuss fall and winter advertising and promotion plans.

NEW SKIL 1/4" DRILL

55% more powerful . . .
yet lighter in weight!

MODEL
75

Boosts production! More comfortable in use! Cuts costs!

There's big portable drill news here for you!

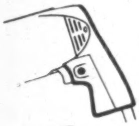
A *new* SKIL heavy-duty drill that's 55% more powerful . . . while it's actually *lighter* in weight!

Here is clearly your short cut to reduced time and labor costs . . . to increased output in every phase on your production line.

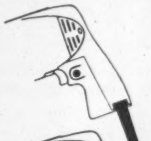
Here is performance without equal . . . top operating power . . . longer operating life. Capacity: ¼" in steel, ½" in wood. A choice of 7 speeds available, from 500 to 5000 r.p.m. . . . designed to meet your individual work needs.

LOOK OVER THESE IMPORTANT FEATURES:

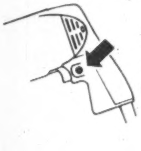
- All anti-friction bearings—for greater efficiency and low maintenance.
- Motor 55% more powerful, yet *lighter* than previous model.



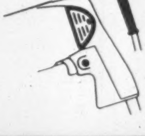
- Contour-fit handle for easier and more comfortable handling.



- New molded rubber strain relief—protects cord against fraying or breakage at drill cord attachment joint.



- Handy, safety-designed trigger lock for continuous operation—side location for easy operation.



- Larger inspection plates, easily removed for checking and cleaning.

FREE!

Convincing Demonstration and Trial Prove "SKIL is the Answer" to Your Production Bottlenecks! Send Coupon Today!

SKIL
PORTABLE TOOLS

Made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in All Leading Cities

MAIL THIS COUPON!

SKIL Corporation, Dept. HPA-104
5033 Elston Avenue, Chicago 30, Illinois

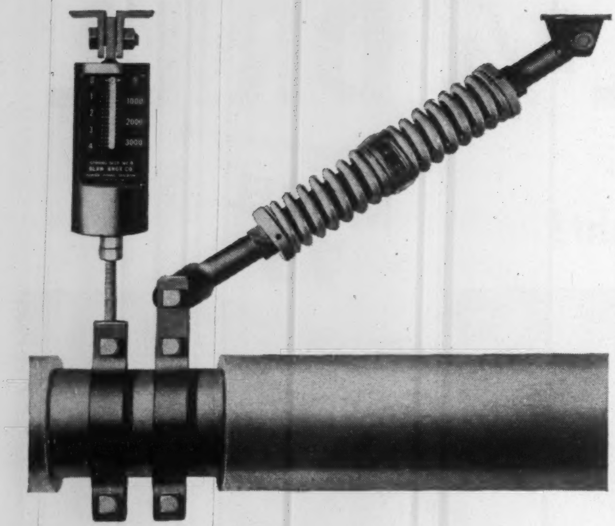
☐ I would like a demonstration and trial . . . *Free!*
☐ Please send me illustrated literature on the new SKIL Model 75 ¼" Drill.

Name________________________

Company________________________

Street________________________

City________________ Zone____ State______



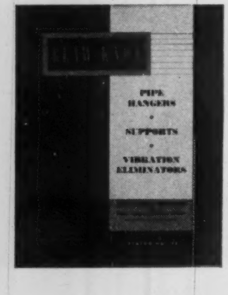
complete hanger units cut your field erection costs

One sure way to cut your field erection costs is to use Blaw-Knox hangers and eliminators. Each is a complete packaged unit, ready to install. No expensive cutting, threading and assembling on the job.

And you'll also save on engineering and specifying time.

Each Blaw-Knox functional spring hanger, rigid hanger assembly, overhead roller assembly, and vibration eliminator is designed for a specific purpose. Constructed to conform with the "code for pressure piping." Available in types and sizes to meet varying conditions.

Any time you'd like some help, our experienced engineers are available to both design and make recommendations for your hanger requirements. Send for your copy of Bulletin No. 54 to get complete information.



BLAW-KNOX COMPANY, Power Piping and Sprinkler Division, Pittsburgh 33, Pa.

BLAW-KNOX

PIPE HANGERS

Complete line of functional spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated power piping systems for all pressures and temperatures.

WHO'S WHAT . . .

▶ *BENJAMIN S. BACON* has been elected president of *BAKER, SMITH & CO.*, according to Paul S. Rupert, chairman of the board. Mr. Bacon has been with the firm since 1905.

▶ *HOBART C. RAMSEY*, president of *WORTHINGTON CORP.*, has announced the election of *HAROLD P. MUELLER* as president and treasurer of the *MUELLER CLIMATROL DIV.* of Worthington. The election of Mr. Mueller follows the establishment of the Mueller Climatrol Div. as a result of the acquisition by Worthington of the former L. J. Mueller Furnace Co.

▶ *MICHAEL KUZMA* has been added to the staff of the Corrosion Engineering Dept. of the *PENNSYLVANIA SALT MFG. CO.* He joined the company in 1952 and until his recent transfer served as sales analyst for the Industrial Chemicals Div.

▶ The *SILENT GLOW OIL BURNER CORP.* has appointed *RICHARD W. SECOR* vice president of the Industrial Heater Div. in charge of portable heater sales.

▶ *MARSHALL G. MUNCE*, vice president of the York Corp., has been elected to fill the unexpired three-year term of J. R. Hertzler on the board of directors of the *AIR-CONDITIONING AND REFRIGERATION INSTITUTE*. He will represent the Year-Round Residential Air-Conditioning Section of ARI on the board.

▶ *R. E. FRIEND* has been promoted to assistant manager of the Permaglas Div. of *A. O. SMITH CORP.* Other changes in the division include the appointment of *W. W. HIGGINS* as director of engineering and *G. M. FOLEY*, who now is personnel manager. Also, *KENDALL H. FLINT* has been named chief engineer in charge of heating.

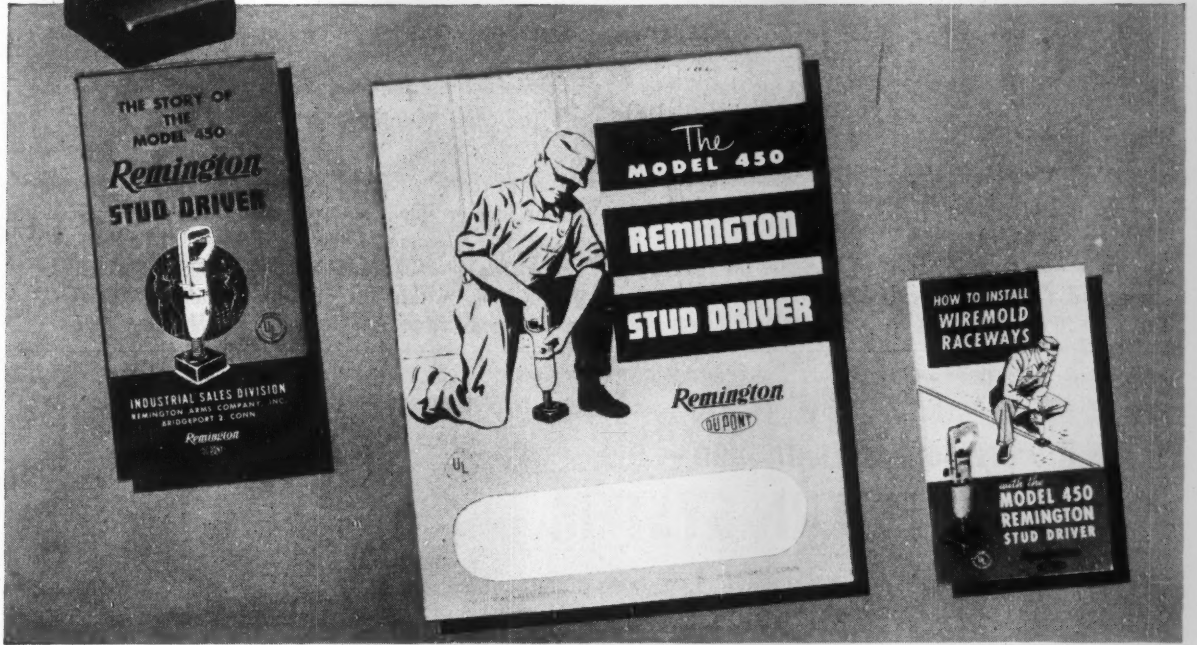
▶ *JOSEPH CLEARY* has been named plant engineer for the *QUAKER RUBBER CORP.*, Div. of H. K. Porter Co., Inc.

▶ *CLARK MUNGER* is the new advertising and sales promotion manager for *BARNES MFG. CO.*

▶ *ALLEN H. OTTMAN* has been appointed executive vice president and general manager of the *ROCHESTER MFG. CO.* He will also serve as a director of the company.

Read how the REMINGTON STUD DRIVER cuts fastening costs!

Free booklets show where powder-actuated tool can be profitably used


THE STORY OF THE MODEL 450
Remington
STUD DRIVER
INDUSTRIAL SALES DIVISION
REMINGTON ARMS COMPANY, INC.
BRIDGEPORT 2, CONN.
Remington
The
MODEL 450
REMINGTON
STUD DRIVER
Remington
DU PONT
UL
HOW TO INSTALL
WIREMOLD
RACEWAYS
with the
MODEL 450
REMINGTON
STUD DRIVER

THE STORY OF THE REMINGTON STUD DRIVER. Here's an easy-to-read illustrated booklet that shows you how the tool operates and points out its important features. You'll see close-ups of the Stud Driver in use, securing structural channels, furring strips and many other fittings to steel and concrete surfaces.

THE REMINGTON STUD DRIVER. A complete catalog — it shows actual-size drawings of the Remington Studs available. Another section deals with the special guards for the tool used to fit over lathing sections, flexible framing sections, wood sills and other sections and fittings.

THE WIREMOLD SYSTEM. It's a specially prepared booklet that describes anchoring Wiremold channels with a Stud Driver. A special Remington guard is available for this application. This booklet takes you step by step through the entire Wiremold Raceway & Wireway installation system.

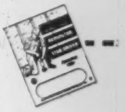
"If It's Remington—It's Right!"

Remington

DU PONT

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON FOR YOUR FREE COPIES



Industrial Sales Division, Dept. HPAC-10
Remington Arms Company, Inc., Bridgeport 2, Conn.

Please send me the booklets checked.

- ☐ **The Story of the Remington Stud Driver**
- ☐ **The Remington Stud Driver**
- ☐ **How to Install Wiremold Sections**

*Name*____________________
*Position*____________________
*Firm*____________________
*Address*____________________
*City*____________________
*State*____________________

WHO'S WHAT

Continued

▶ *W. DEE SHEPHERD* has been named sales manager of *WESTINGHOUSE ELECTRIC CORP.*'s Atomic Power Div. He was formerly contract manager for the division.

▶ At the recent annual sales meeting, *JAMES E. KUPPE* was appointed general sales manager of *CARVER PUMP CO.* He succeeds *ROBERT E. TANNER*, who is also vice president and general manager of the company.

▶ *ROBERT N. GIERSE* now is sales manager of the *FARRIS FLEXIBLE VALVE CORP.*

▶ *JOHN P. HESLIN*, vice president of the Western Div. of *UNISTRUT PRODUCTS CO.*, has been named vice president in charge of sales. *A. J. CROZE*, vice president of engineering sales, has been promoted to the post of vice president in charge of engineering.

▶ *DR. CARL T. ASHBY*, chief engineer for refrigerators and freezers at *SERVEL, INC.*, has been appointed to the same post for "all-year" air conditioning. *EDWIN C. GEISHERT*, assistant chief engineer for room air conditioners, was named to head a separate engineering department for room air conditioners and compression type air conditioners.

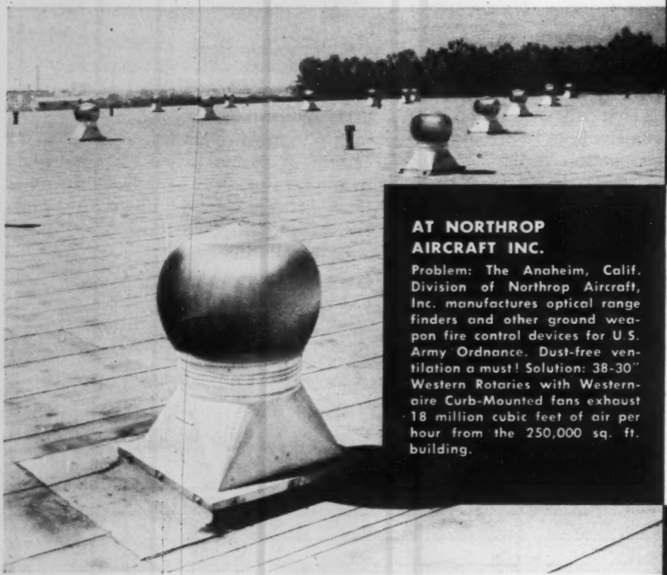
▶ *WILLIAM C. RING* is the new chief engineer for the Valve Div. of the *RA-RICH MFG. CORP.*

▶ The *TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION* has announced the appointment of *KARL A. GARDNER* as chairman of its technical committee. Mr. Gardner is chief engineer of the Griscom-Russell Co.

▶ New sales manager of the Controls Div. of *JACKES-EVANS MFG. CO.* is *JOHN H. MARLING*. He has represented the company for a number of years in the Dayton and Detroit areas.

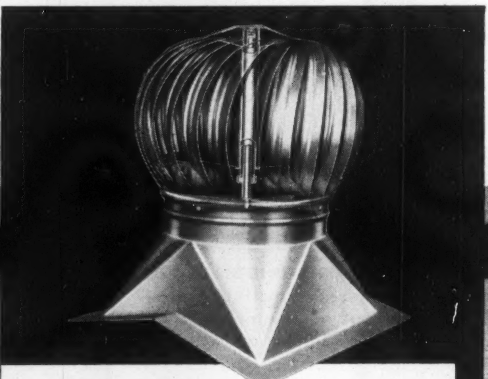
▶ *STEPHEN L. INGERSOLL* has been promoted from vice president and treasurer to the post of executive vice president of the *INGERSOLL STEEL DIV.* of *BORG-WARNER CORP.* Three other executive promotions within the division include *HAROLD G.*

Where the problem is ventilation — the solution is a **WESTERN SYSTEM**



AT NORTHROP AIRCRAFT INC.

Problem: The Anaheim, Calif. Division of Northrop Aircraft, Inc. manufactures optical range finders and other ground weapon fire control devices for U.S. Army Ordnance. Dust-free ventilation a must! Solution: 38-30" Western Rotaries with Westernaire Curb-Mounted fans exhaust 18 million cubic feet of air per hour from the 250,000 sq. ft. building.



AT YOUR PLANT

Western Rotary ventilators, with or without fans, can do the most for you. A 2 mph wind operates the Western Rotary—and it continues to exhaust during wind lulls due to superior balance design. Years of trouble-free performance—bearings carry lifetime guarantee. Check Sweet's or AEC for high exhaust capacity figures. Then specify Western—a first-rate line of rotary, stationary, continuous ridge, directional ventilators and exhaust fans. Handled by wholesalers coast to coast.

Western Engineering & Mfg. Co.
4118 OCEAN PARK AVE. • VENICE • CALIF.

***Dealers**—order from your local jobber.*
Write for catalog, or tell us your special installation problems.

A thermostat in every room

FOR OFFICE BUILDINGS

The temperature of every office can be regulated to suit individual needs. Temperature stays at thermostat setting regardless of varied heat loss from glass areas, or from cold and warm sides of the building.

IRON FIREMAN SelecTemp CENTRAL HEATING

TRADE MARK

Continuous Modulated Heat with Individual Room Control, for Gas, Oil, or Coal

FOR APARTMENTS, HOTELS AND MOTELS

Occupants of each room can have the temperature they select without affecting the heat delivered to other rooms. The steam heat is continuous. Room units circulate warmed air, modulated automatically to balance heat loss from each room and maintain the individual temperature selected. No gas or combustion in rooms—no venting required.

FOR HOSPITALS, SCHOOLS, INSTITUTIONS

The varying needs of patients rooms, of service and operating rooms, of offices and public lounges, are met with extreme precision and with almost immediate response to any desired change of temperature. Filtered outside air for ventilation can be introduced when desired. Positive circulation of air within each room but no circulation *between* rooms.

FOR EVERY SIZE AND TYPE OF HOME

Any temperature desired is available in any room, at any time. For example: bathrooms at 75°, living room at 72°, work and play rooms at 65°, and grandmother's room or baby's bath at 78°. Air is warmed by steam, quietly circulated by steam driven fans and cleaned by efficient air filters. Room units have no electrical connections.

A COMPLETELY NEW CONCEPT IN HEATING

Iron Fireman SelecTemp is the only heating system that combines individual room control with continuous, modulated heat, yet initial and maintenance costs are *substantially less* than other zone control systems, with complex electrical equipment. No other system can accomplish these results in such a simple and practical way, or be so easily installed in either old or new construction. Added to this economy is the exceptionally low operating cost. Unused rooms can be kept at low temperature and then heated to a higher temperature, when desired, within a few minutes.

SelecTemp heating gives many important and unique advantages, not only to occupants but to owners and builders as well. For full information, mail the coupon.

THE IRON FIREMAN

SelecTemp

TRADE MARK

PRODUCT OF IRON FIREMAN

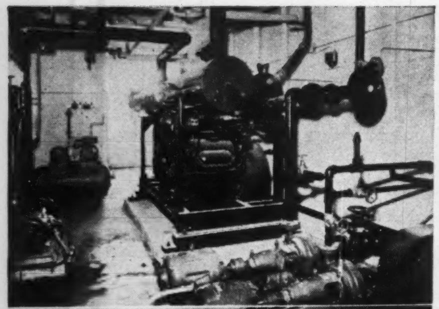
IRON FIREMAN MANUFACTURING CO.
3071 W. 106th Street, Cleveland 11, Ohio.

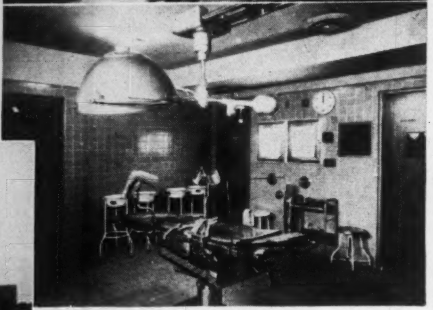
Please send literature on Iron Fireman SelecTemp heating.

Name____________________

Address____________________

City________________ State________





Rx apply Vilter refrigeration

Patient: Johnston Memorial Hospital
Smithfield, Johnston County, North Carolina

Description: Patient very young, opened in 1952. 100 beds. Modern design, latest equipment.

Condition: Patient needed dependable, accurately controlled cooling for a number of important functions: Air conditioning the Emergency Operating Suite, the Operating Suite, and the Delivery Suite; Providing refrigeration for meat at 20° F.; Providing 35° cooling for the dairy, vegetable, and garbage walk-in coolers; Maintaining proper temperature in the mortuary cabinet.

Prescription: Vilter self-contained condensing units and equipment of the proper size for each of these uses—a total of four units, comprising over 34 horsepower.

Comments: Patient comfortable, doing fine. Vilter refrigeration is "just what the doctor ordered."

Attending: Architect: George Watts Carr, Durham, N.C.
Engineer: William M. Wallace, II, Durham, N. C.
General Contractor: T. A. Loving Co., Goldsboro, N. C.
Air Conditioning and Refrigeration Contractor: Morris & Gorrell, Inc., Raleigh, N. C.

Vilter®

Your nearby Vilter Representative or Distributor will be glad to prescribe the proper Vilter refrigeration to solve your cooling problems. Check with him now.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, MILWAUKEE 7, WIS.

Air Conditioning • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Double Pipe Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pakicers • Pipe Coils • Valves & Fittings

WHO'S WHAT

Continued

INGERSOLL, JR., previously assistant to the president of the division, who is now vice president and secretary; *RALPH W. LEIGH*, also formerly an assistant to the president, now vice president in charge of sales; and *WILLIAM C. ZEPF*, previously assistant secretary, who now becomes treasurer.

▶ Four new vice presidents have been elected by the board of directors of *BELL & GOSSETT CO.* They are *W. A. BOONE*, *H. A. LOCKHART*, *R. A. MARQUARDT*, and *C. R. SMITH*.

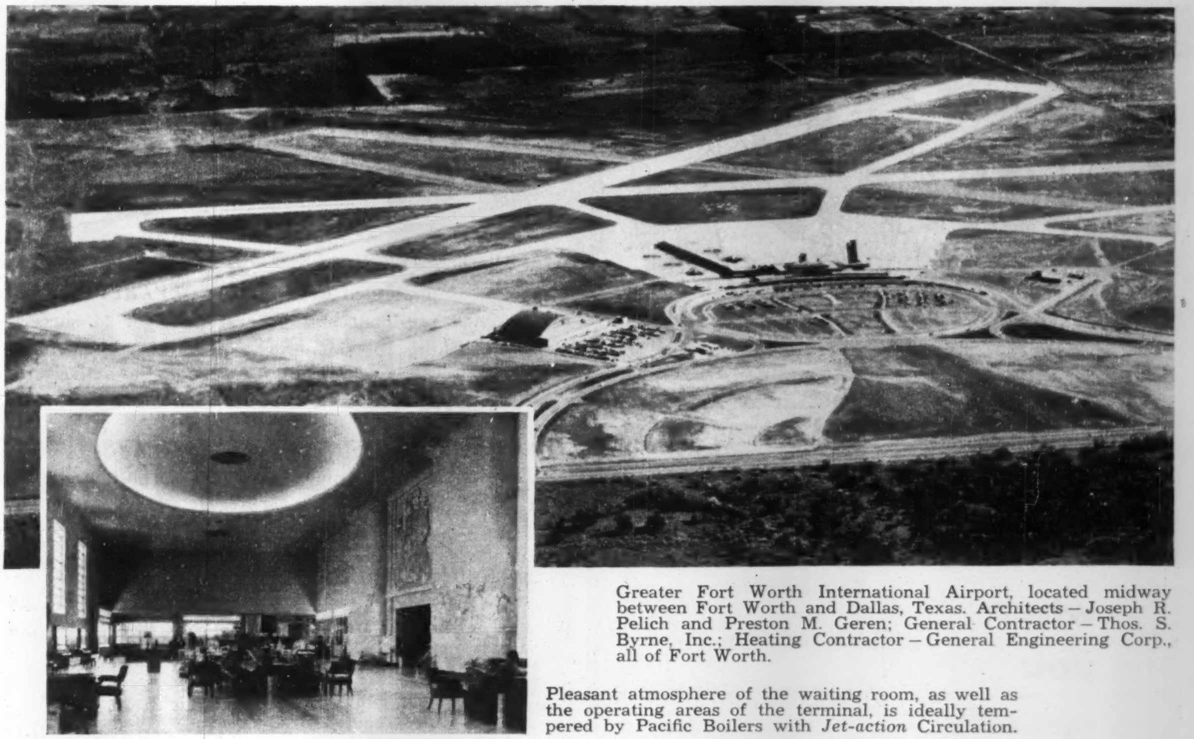
▶ *WALTER A. SHARRITTS* and *M. L. TRIPLETT* have taken key production posts with *ACME INDUSTRIES, INC.* Mr. Sharritts becomes manufacturing manager and Mr. Triplett has been named factory manager. The two men have worked together for the past 25 years at General Motors and Carrier Corp.

▶ *PROF. HAROLD O. BOLZ* begins his duties this month as associate dean of the College of Engineering of *OHIO STATE UNIVERSITY*. Professor Bolz was head of the general engineering department at Purdue University.

▶ *JOSEPH H. COWAN* has been promoted to sales manager of *KENCO, INC.*

▶ *JOHN E. CRAIG* has been named manager of the packaged refrigeration sales division of the *UNITED STATES AIR CONDITIONING CORP.* Mr Craig was formerly associated with the Carrier Corp.

▶ *A. L. WOODS* has been appointed assistant to the vice president of metal sales and procurement of *CALUMET & HECLA, INC.* This new assignment is in addition to his responsibilities as director of purchases of the firm's Wolverine Tube Div.



Greater Fort Worth International Airport, located midway between Fort Worth and Dallas, Texas. Architects – Joseph R. Pelich and Preston M. Geren; General Contractor – Thos. S. Byrne, Inc.; Heating Contractor – General Engineering Corp., all of Fort Worth.

Pleasant atmosphere of the waiting room, as well as the operating areas of the terminal, is ideally tempered by Pacific Boilers with *Jet-action* Circulation.

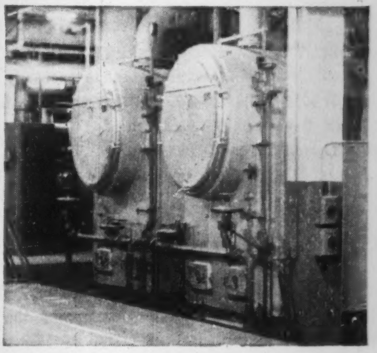
Pacific Boilers with *Jet-action* Circulation temper climate at Fort Worth airport terminal

When temperatures drop at the Greater Fort Worth International Airport, Pacific Boilers go to work quickly and efficiently in the modern new terminal building. Steam is speeded on its way almost instantly . . . for Pacific Boilers—and only Pacific Boilers—have super-fast *Jet-action* Circulation!

What's so different about *Jet-action* Circulation? The secret is in Pacific's circulating connections. Like miniature jet nozzles, they blast supercharged streams of steam and hot water across the heating tubes, sweeping away—and keeping away—heat-insulating bubbles that would ordinarily cling to the tubes and slow down heat transfer. Tubes absorb heat faster . . . response is practically immediate!

Your customers would welcome this faster heating action, too! Because, in addition to its quicker response, *Jet-action* Circulation wrings more heat from a given amount of fuel than any other system!

To give your customers this extra efficiency and economy, specify Pacific Boilers. They come in all sizes, for all fuels, for any type building . . . and they are easy to install. For complete data call your Pacific representative today.



These two Pacific Boilers, rated at three million btu per hour each, heat the terminal building. Pacific Boilers make installation easy, because they can be shipped in one, two or three sections, depending on individual requirements.

Designed
Constructed
and Stamped in
Accordance with
ASME Code

UNITED STATES RADIATOR CORPORATION: Boilers, Radiators, Heating Accessories • Pacific Boilers • Cyclotherm Steam Generators • Metal Products • Drayer-Hanson Air Conditioning and Commercial Refrigeration

Pacific Steel Boiler
DIVISION • UNITED STATES RADIATOR CORPORATION
GENERAL OFFICES: DETROIT 31, MICHIGAN

No need to improvise or compromise when you specify

AGITAIR

Only AGITAIR square and rectangular air diffusers are custom-made to suit conditions of each application. The patented, built-in diffusing vanes are scientifically arranged in various louver patterns which provide blows in 1, 2, 3 or 4 directions without use of blank-offs. This feature eliminates the necessity of "oversizing" to compensate for blank-offs or baffles.

When you specify AGITAIR square and rectangular diffusers you can be sure of 100% draftless air distribution from any ceiling or sidewall location. What's more, these smart, modern units are now available with or without removable, interchangeable cores. Whatever the space condition, there's an AGITAIR custom-made to give perfect performance and complete satisfaction.

New 34-page Type R Catalog reveals how correct air distribution is simplified by AGITAIR. Contact your local AGITAIR representative, or write us direct for your free copy.

AGITAIR®
SQUARE AND RECTANGULAR AIR DIFFUSERS

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

WHO'S WHAT

Continued

▶ *E. B. SEVERS* has been appointed development engineer in the Erection Dept. of the *BABCOCK & WILCOX CO.'s* Boiler Div. Mr. Severs will be located in the department's headquarters in Barberton, Ohio.

▶ The board of directors of *BEAVER PIPE TOOLS, INC.* has appointed *CHARLES T. EVERETT* executive vice president and general manager to succeed W. A. Phillis, president, who will retire in the near future.

▶ *GEORGE BEESE* has joined *UNIVERSAL CONTROLS CORP.* as plant manager. He had been with C. A. Dunham Co.

▶ *FRANK W. ZURN* has been named manager of engineering sales of *J. A. ZURN MFG. CO., AMERICAN FLEXIBLE COUPLING CO.* and its affiliates. New administrative assistant is *DAVID H. LUND.*

▶ *C. NELSON WETHERELL* has been appointed to the newly created post of manager of training and education for *JOSEPH T. RYERSON & SON, INC.*

▶ *JOSEPH L. NELSON* has been appointed design manager of the Specialty Products Div. of the *EDWIN L. WIEGAND CO.*

▶ *STANDARD OIL CO.*, Indiana, has established a new general engineering department and announced appointment of five executives to new positions. Those named are *G. W. WATTS* as director of engineering and engineering research with offices in Chicago; *F. W. SCHEINEMAN*, department manager, and *G. M. KERANEN, W. G. GUILD,* and *C. E. EVANS,* assistant department managers. Department offices are in Whiting, Ind.

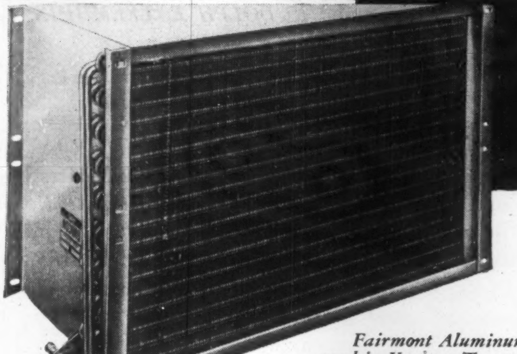
▶ *J. P. COUGHLIN*, former manager of the Arc Welding Div. of Westinghouse Electric Co., has joined *EUTECTIC WELDING ALLOYS CORP.* as assistant to the president.

▶ *THOMAS J. CORBETT* has been named product engineer in the heating research section of the *NATIONAL RADIATOR CO.* He will be responsible for the design and development of new steel boiler lines.

▶ *JOHN W. SIMPSON* and *JOHN T. STIEFEL* have been appointed project managers of the *WESTING-*

Better Yet,

USE FAIRMONT aluminum



Fairmont Aluminum used in Kramer-Trenton "Unicon" air-cooled condenser.

In finned condenser surfaces, and in all better parts and accessories for heating and cooling applications, Fairmont 2S, 3S and 52S wrought aluminum sheet is nationally recognized for highest quality and uniformity. Improved appearance, high thermal conductivity, light weight, wear-resistant ductility, and non-corrosive and stainproof surfaces—all these objectives and more are readily achieved.

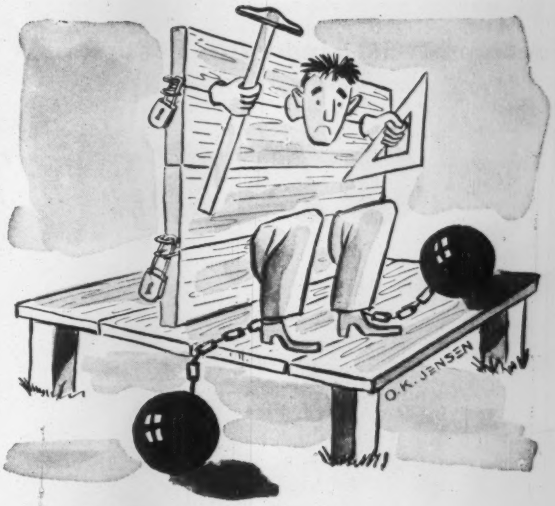
Fairmont bright aluminum rolling mill products—sheet, coil and circles, are now available for prompt delivery to meet manufacturing schedules.

FALCO

SALES OFFICES:

Baltimore, Buffalo, Chicago, Cleveland, Denver, Fairmont, Indianapolis, Los Angeles, New York City, Philadelphia, St. Louis, Schenectady

FAIRMONT
ALUMINUM COMPANY
•
Fairmont, West Virginia



Shed those design shackles, specify

AGITAIR

You can give free rein to your creative planning and still rely on AGITAIR square and rectangular diffusers to provide draftless air distribution from any location. Custom-designed, with built-in diffusing vanes, in a wide variety of louvered patterns, they provide blows in 1, 2, 3 or 4 directions without use of blank-offs. AGITAIR diffusers need not be centrally located in an area if such placing does not agree with the decorative motif, or if a beam or other obstruction is in the way.

Moreover, AGITAIR square and rectangular diffusers are now available with or without removable, interchangeable cores. AGITAIR also brings you Stripline, the slender, continuous air diffuser with unlimited application versatility.

New 34-page Type R Catalog reveals how correct air distribution is simplified by AGITAIR. Contact your local AGITAIR representative, or write us direct for your free copy.

AGITAIR® SQUARE AND RECTANGULAR AIR DIFFUSERS

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

For commercial & industrial heating with

GAS

field

"MG" Draft Controls are recommended by the nation's leading gas companies as

SAFE

Now you can eliminate heavy fuel wastes with complete safety. With four years of perfect performance behind it the Field "MG" now carries the recommendation of leading gas companies across the country—fully safe, absolutely dependable, highly efficient. But be sure the control you install is a Field. In a gas installation only a perfect control is a good control.

Write for technical information and performance data on the Field "MG" Draft Control.

FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

WHO'S WHAT

Continued

HOUSE ELECTRIC CORP.'s atomic power division. Mr. Simpson becomes manager of the pressurized water reactor project and Mr. Stiefel becomes manager of the submarine thermal reactor project.

▶ *DR. ATHELSTAN SPILHAUS,* dean of the Institute of Technology at the University of Minnesota, has been retained by *MINNEAPOLIS-HONEYWELL REGULATOR CO.* as a consultant in the fields of engineering and research.

▶ At a recent meeting of the stockholders of *AIR-FLOOR CO. of CALIFORNIA, INC., JOHN C. LEEMHUIS, JR.*, was re-elected president. Other officers elected were *LOUIS L. LEEMHUIS,* executive vice president; *PAUL T. OLAFSON,* vice president and secretary; and *RUDOLPH E. LEEMHUIS,* vice president and treasurer.

IN THE TERRITORIES . . .

▶ For *CRANE CO.—JESS H. SLAUGHTER* has been appointed assistant manager of the Wholesalers Dept. in Chicago. He succeeds *R. W. HAGENBUCH,* who recently was named manager of the Boston branch. In other Crane appointments, *GEORGE W. STRADTMAN, JR.*, became manager of the branch at Charleston, S.C. and *JOSEPH M. HORNE* will head the Orlando, Fla., branch.

▶ For the *NATIONAL RADIATOR CO.—W. L. NELLIGAN* has joined the sales staff and is assigned to the branch office in Boston. Covering central Illinois is *FRANKLIN J. BARR* of Lacon, Ill. *JOHN D. OZIER,* 1324 Meadow Lane, Birmingham, Ala., is covering the state of Alabama for the heating products of the firm. He is working out of the branch sales office in Richmond, Va.

▶ For *FRICK CO.—HUGO REICHENBACH* is the new manager of the St. Louis branch office.

▶ For *AMERICAN GILSONITE CO.*—The *HENRY P. THOMPSON CO.* has been named exclusive distributors of "Gilsulate" for the Cincinnati area.

▶ For the *PHILIP CAREY MFG. CO.—J. W. BARTLETT* now is Cincinnati district manager. He succeeds W. H. Skinner, who is retiring.

▶ For *DRAVO CORP.*—The *D. M. ROBINSON CO.*, 2436 South Boulevard, Houston, Texas, is the dis-

There is **NOTHING LIKE**

Nature's Own Insulation...

The unique character of Cork is nature-made. Principal qualities required for most efficient low temperature insulation are *inherent* in Cork and have established Cork's reputation for utmost efficiency, economy and long-life.

To Cork's nature-made advantages, Mundet adds careful selection and grading of the raw material... to be sure that it is the best quality for the purpose. Mundet then fabricates the Cork into the most serviceable forms for commercial refrigeration, air conditioning and other applications of low temperature.

Modern manufacturing methods are only part of the service that Mundet provides to insure maximum satisfaction from use of Mundet Corkboard and Cork Pipe Covering. Through Mundet contract service, we take full responsibility for the proper installation of our products.

Let us show how our closely integrated service can benefit you.

There's a Mundet Office near you

ATLANTA, GA.
339 Elizabeth St., N.E.
BALTIMORE 30, MD.
100 S. Charles St.
CINCINNATI 2, OHIO
427 West Fourth St.
DALLAS 10, TEXAS
601 Second Ave.
DETROIT 21, MICH.
14401 Prairie Ave.
HOUSTON 11, TEXAS
6601 Supply Row
P.O. Box 9301
INDIANAPOLIS 3, IND.
1250 Beecher St.
JACKSONVILLE 6, FLA.
800 East Bay St.—Door 44
KANSAS CITY 1, MO.
1210 West 9th St.
LOS ANGELES, CAL.
(Maywood)
6116 Walker Ave.
NEW ORLEANS 16, LA.
315-325 North Front St.
NEW YORK 17, N.Y.
331 Madison Ave.
PHILADELPHIA 39, PA.
856 North 48th St.
ST. LOUIS 9, MO.
3176 Brannon Ave.

In Canada:
Mundet Cork &
Insulation Ltd.
35 Booth Avenue, Toronto

MUNDET CORK CORPORATION
Insulation Division
7209 Tonnelle Ave., North Bergen, N. J.

Without obligation, send me your insulation manual, describing Mundet Cork Insulation Products.

NAME ....

FIRM ....

ADDRESS ....

Mundet Insulation Products include: "Custom-Molded 85% Magnesia Pipe Covering, Magnesia Blocks and Segmented Covering for Heat Insulation; High Temperature Pipe Covering and Blocks; "Jointite" Cork Pipe Covering and Corkboard for Low Temperatures.

WHO'S WHAT

Continued

tributor for heaters and industrial air conditioners for several counties in Texas and Louisiana.

▶ For *HAMER VALVES*—The *SHELBY JONES CO.* is the new sales representative in the eastern Pennsylvania, Delaware and southern New Jersey territories.

▶ For *WOLVERINE TUBE, DIV. of CALUMET & HECLA, INC.*—*GEORGE W. OVERSTREET* has been appointed sales representative in North and South Carolina and portions of Tennessee and Georgia. His offices are at 1627 Anderson St., Charlotte, N.C.

▶ For *MODINE MFG. CO.*—Three new sales representatives are the *GIBSON-TOWNSEND CO.* in the Des Moines territory; *A. N. DUNN*, South Bend, Ind.; and *TOM E. KRIEG*, Tulsa.

▶ For *GENERAL ELECTRIC CO.*—*HERBERT J. WYNN* is the new field representative for the Weathertron Dept. and will be responsible for sales in western Pennsylvania, West Virginia, Kentucky, Ohio, and Indiana. He will have his office in Canton, Ohio.

New regional manager of the Air Conditioning Div. is *WILLIAM A. MULCOCK*. He will be in charge of sales in Region III comprising Wisconsin, Minnesota, Missouri, Iowa, Kansas, North Dakota, and parts of Illinois, Indiana, Michigan, Nebraska and South Dakota.

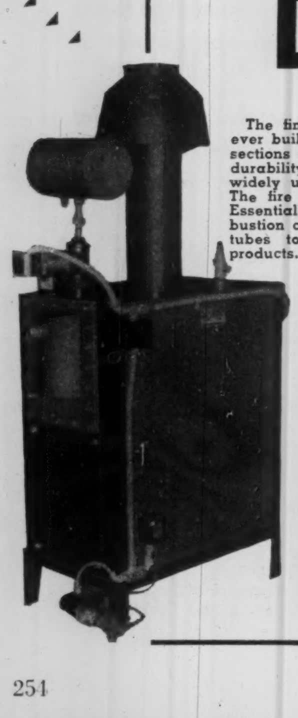
▶ For *J. H. FRANCE REFRACTORIES CO.*—*C. G. BLANDY* has been appointed Philadelphia district sales engineer.

▶ For *MASTER TANK AND WELDING CO.*—*WALTER L. ALLEN* is the new sales representative in Texas and New Mexico. His headquarters are in Luling, Texas.

▶ The sales-engineering firm of John T. Couchman Co., Indianapolis, is now *COUCHMAN-CONANT, INC.* as *ALAN CONANT* joins the organization. Both men have been associated with *EDWIN L. WIEGAND CO.* for more than 20 years.

▶ For the *RITTLING CORP.*—The *DAVID S. FALK CO.*, 4864 Woodward Ave., Detroit, has been appointed engineering sales representative in that area.

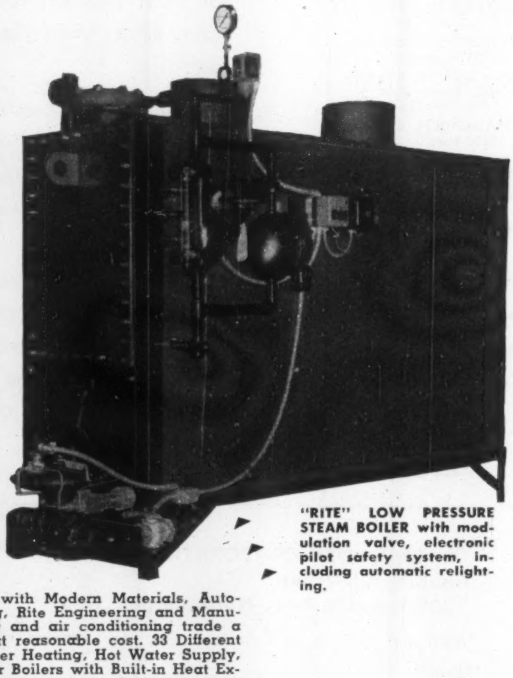
RITE "LIMELITE" with built-in heat Exchanger, having full boiler output.



Few Will Dispute!

The finest, largest, and MOST EFFICIENT Boilers ever built are of WATER TUBE design. The pressure sections are built of STEEL. Because of its superior durability and strength, steel has become the most widely used structural material conceived by man. The fire box sections are built of refractory brick. Essentially, they are a furnace, where efficient combustion can take place, and a bundle of water-filled tubes to extract the heat from the combustion products.

Boilers of this type can be found in practically every large city in the world as a power source for a pumping station or electrical power plant. The amazing thing about this fact is many of them were installed during the late 1800's or shortly after the turn of the century and they are still giving faithful, efficient service. To thousands of architects, engineers, and users the words WATER TUBE, STEEL, EFFICIENCY, PERMANENCE became SYNONYMOUS.

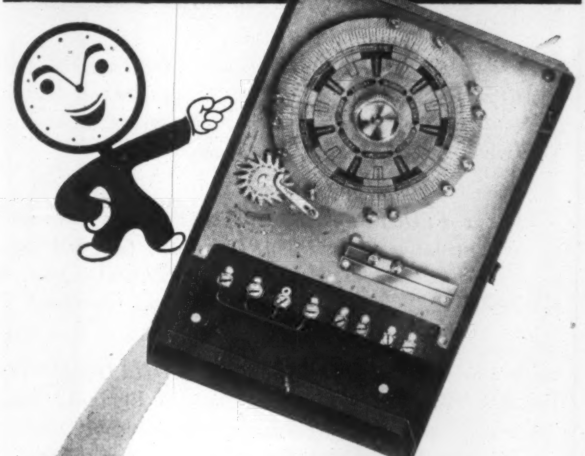


"RITE" LOW PRESSURE STEAM BOILER with modulation valve, electronic pilot safety system, including automatic relighting.

Now, by combining these fine features with Modern Materials, Automatic Controls, and Production Engineering, Rite Engineering and Manufacturing Corporation offers to the heating and air conditioning trade a Completely Automatic Water Tube Boiler at reasonable cost. 33 Different Sizes — Gas, Oil or Gas Combination, Water Heating, Hot Water Supply, Low Pressure Steam. Both Steam and Water Boilers with Built-in Heat Exchanger having Full Boiler Output. We urge you to contact your nearest agent or our factory for further information.

RITE ENGINEERING AND MANUFACTURING CORPORATION
144 South Mission Road Los Angeles 33, California

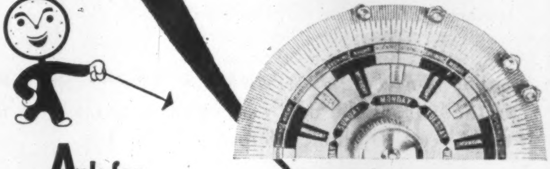
Cut customer fuel bills 7 days a week



it's good business to always install a PARAGON 700 Series Calendar Time Switch on commercial heating units

YES, the good word gets around fast when a Paragon 700 Series Time Switch is on the job cutting heating bills. Heat is *automatically turned off* when not needed. Customer satisfaction through lower fuel bills *plus* fewer service "call backs" are big profit boosters for you! Check these features: :

- **COMPLETELY FLEXIBLE** — completely economical. Switch settings can be made for the entire week's schedule, yet easily and quickly changed. ON-OFF or OFF-ON operation can be as close as 3 hours.
- **FULLY AUTOMATIC** — set it, then forget it. Saves money weekends, for example: switch may be set to cut off heat Saturday noon, then automatically start regular heating cycle earlier than usual Monday.
- **INSTANTLY CHANGEABLE** — simply set the dial trippers at desired day or night hours. Total of 14 are supplied as standard equipment.



Ask for Bulletin HP-5407

See your jobber, or write:

Dial is graduated in hours and half hours. Night and day periods clearly separated. Available in 24, 120 and 240 volts; 25, 50 and 60 cycles. No complicated wiring. Lists as low as $27.50.

PARAGON ELECTRIC COMPANY

TWO RIVERS, WISCONSIN

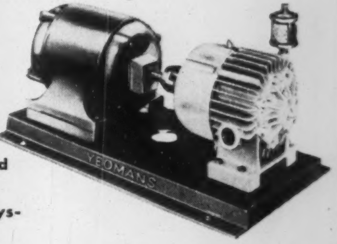
World's Foremost Manufacturer of Time Controls

Compressor and Pump

BRIEFS

from the Yeomans Guard

Yeomans No. 545 Rotary Compressor and Vacuum Pump



- Recommended for pressures up to 25 lb. gauge and vacua up to 28" Hg.
- Adaptable to a wide range of applications — will handle ammonia and other gases.
- Positive lubrication system.

This new Rotary Air Compressor and Vacuum Pump has a simplicity in design and operation which makes it one of the most economical units available per pound of cubic air delivered.
The No. 545 is of the positive displacement, multi-cellular rotary single stage type suitable for direct connection to motor, gasoline engine, belt or other form of drive. Continuous lubrication of blades and housing is secured through a suction oil-wick lubricator. An oil mist lubricator has proved in service to be the best method of providing oil to the blade area.

Positive Cooling Action. Positive blower cooling action accomplished with an external fan and deflector.

Compact and efficient. Rotor has a number of radial slots milled along its full length. In each slot is inserted a light weight, extremely tough composition blade. Action of the blades is dependent wholly upon centrifugal force — no springs are required — and any wear is compensated for automatically.

Literature is now available on this new No. 545 Rotary Compressor and Vacuum Pump. Gives complete description and specifications. Ask for Bulletin 7545.

Almost a Half-Century of Dependable Service *NOW back on the job* as good as new

This Yeomans 3-inch Vertical Bilge Pump was installed in 1907 and has given reliable service all these years without any major repairs . . . but it did finally begin to show signs of wear. Management knew of the special reconditioning facilities of Yeomans and feeling there was life in the old pump yet . . . returned it for overhaul.

Management was right! In the special service shop at Yeomans (where a pump is never too old to have parts replacements) this Bilge Pump was taken apart, inspected, cleaned, and reassembled with a new impeller, shaft, top bearing, suction plate and discharge pipe. It looked like new with its new paint job . . . and it is performing that way on the job.

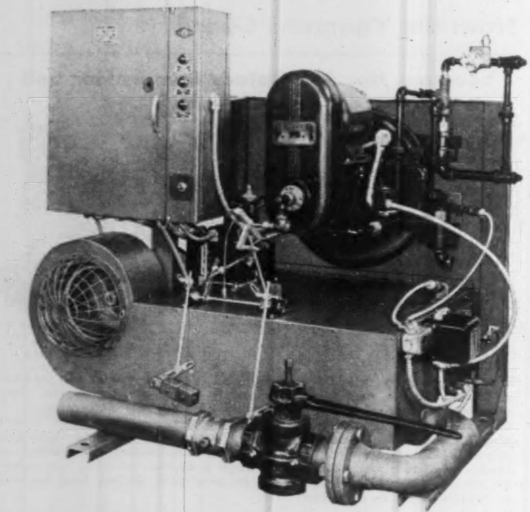
Had this pump been a few years younger it could have received still another modernization treatment in the Yeomans reconditioning shop . . . *LUBRI-VAC (R) could have been added to make it better than ever.* LUBRI-VAC is the most important development in vertical wet pit pumps since their introduction. It is a system of lubrication, developed by Yeomans, that keeps the main bearing properly lubricated at all times. Field data on hundreds of pump installations prove conclusively that LUBRI-VAC has reduced bearing failure by an impressive 95%. Learn more about this development. *LUBRI-VAC can be incorporated into many Yeomans Wet Pit Centrifugal Pumps now in use!* Consult factory for further information. System is described in Bulletin 3-8001.
See Pre-Filed Catalogs for complete line of Yeomans Pumps or call your local Yeomans representative . . . he's listed in the yellow pages of the phone book under "Pumps."

® Registered Trademark

YEOMANS BROTHERS COMPANY

2000-5 No. Ruby Street, Melrose Park, Ill.
(suburb of Chicago)

WEBSTER ROTONETIC*



DUAL FUEL FIRING BURNER

- √ Sizes from 75 to 300 horsepower.
- √ Minimum gas pressure requirements.
- √ Low installation costs.
- √ Maximum efficiencies on BOTH gas and oil.
- √ Minimum base height requirements.
- √ Utilizes all grades of fuel oil.
- √ Extremely low noise level.
- √ Approved electronic combustion safeguard system.
- √ Simpler changeover than ever before.
- √ One hundred per cent forced draft.
- √ Completely assembled, piped, wired and tested.

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

Listed by Underwriters' Laboratories, Inc.

*TRADEMARK *Write for Literature*

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

WHO'S WHAT

Continued

▶ For *UNITED STATES AIR CONDITIONING CORP.*—The *R. C. BLACK CO.*, 4330 Lake St., Rochester, N.Y., has been named manufacturer's representative covering the western half of New York.

▶ For the *DELTA HEATING CORP.*—*EDWARD BLACK* has been appointed coordinator of sales in southern New Jersey, Delaware, Maryland, District of Columbia and eastern Pennsylvania.

▶ For *FEDDERS-QUIGAN CORP.*—Two new sales representatives are *EDWARD H. COX CO.*, 304 Crosby Bldg., Buffalo, N.Y. and *TOMLINSON STEAM SPECIALTY CO.*, 1599 St. Clair Ave., Cleveland.

▶ For *KENNARD CORP.*—The *PHILLIPS-MOORE EQUIPMENT CO.*, 704 E. Yandell Blvd., El Paso, Texas, has taken over as representative of products for New Mexico and part of southwestern Texas.

▶ For *NIAGARA MACHINE & TOOL WORKS*—*CLIFFORD R. BOECKLER* has been appointed district manager of the new western New York territory office. The office is located in the firm's plant at 683 Northland Ave., Buffalo.

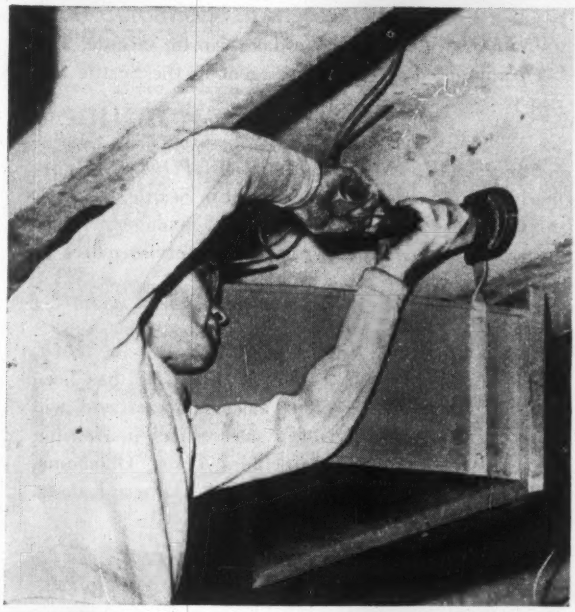
▶ *TRANE CO.'s* sales office in Greenville, S.C. has been moved to the Shives Bldg., 644 E. Stone Ave. In addition, the company's Charlotte, N.C., sub-office of the Greensboro sales office is now located in the Smith Bldg. at 116½ S. Church St. *LOY F. THOMPSON* is sales engineer in charge of the office. The Nashville, Tenn. sub-office of the Louisville sales office is now located at 1810 Broad St. Sales engineer in charge of this office is *FRED DAVIDSON, JR.*

▶ For *COMBUSTION ENGINEERING, INC.*—*WARREN L. MacDONALD* has been appointed district manager of the Los Angeles office.

▶ For *GENERAL DYNAMICS CORP.*—*ROBERT HOFFMAN* is the new western regional manager for the Electro Dynamic Motor-Generator Div.

▶ For *INSUL-MASTIC CORP. of AMERICA*—New representative in the Indianapolis area is *MALCOLM BUILDERS, INC.*

▶ For *MURRAY IRON WORKS CO.*—The Pipework and Boiler Div. of *MacISAAC AND MENKE CO.*, Los Angeles, has been appointed western representatives for the company's line of boilers.



Ramset SAVES $11,000

FASTENING SYSTEM

for Fastening Air Ducts in Texas' Largest Store

More than two miles of air conditioning ducts were installed with RAMSET SYSTEM in the new addition to Joske's Department Store at San Antonio, Texas, the "largest store in the largest state."

By using RAMSET Jobmaster, anchoring studs were set at the rate of better than 1 per minute, instead of an estimated 15 minutes each by old-fashioned, conventional methods. Substantial cost savings were thus gained, as well as a far faster, completely secure installation. Similar results were obtained for hanging 13 miles of sprinkler piping and anchoring 43 miles of electric conduit.

Ask your dealer or write us for details on how you can make more profit from every job by using RAMSET SYSTEM.

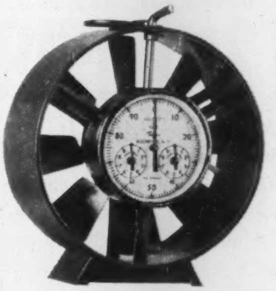
Ramset Fasteners

Ramset Fasteners, INC.

Ramset Division, Olin Industries, Inc.
12109 BEREA ROAD • CLEVELAND 11, OHIO

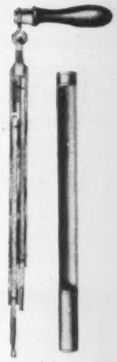
FIRST IN POWDER ACTUATED FASTENING AN Olin PRODUCT

HOW FAST?



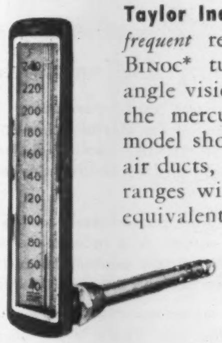
Taylor Biram's Anemometer is designed for use in air ducts, tunnels, furnaces, flues, etc. The three dials register velocity of air currents to 10,000 ft. Each instrument is tested and a chart of corrections furnished for velocities of from 200 to 3,000 ft. per minute. **Catalog #3132. Price $75.00.**

HOW MOIST?



Taylor Sling Psychrometer is considered the basic standard for accurate measurement of relative humidity, since it provides a simple means for creating suitable circulation of air. Length 12″. Catalog No. 1321: 30° to 200° in 1° divisions—**$9.00.** Catalog No. 1322: 20° to 120° in ½° divisions—**$9.00.** Catalog No. 1324; 25° to 40° in 1/10° divisions—**$13.00.**

HOW COLD?



Taylor Industrial Thermometers invite *frequent* reading, thanks to exclusive Binoc* tubing which provides wide angle vision and high magnification of the mercury column. The 90° angle model shown is especially suitable for air ducts, dry kilns etc. Many standard ranges within minus 50 to +400°F or equivalent Centigrade. Your choice of stem angles and connections. Thermometer illustrated (Range 0° to 160°F, 6″ stem, 9″ scale). **Catalog #12EU349. Price $25.25.** *Reg. U. S. Pat. Off.

There is a Taylor Instrument or control system for every air conditioning need. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.*

Taylor Instruments

MEAN ACCURACY FIRST

WHO'S WHAT

Continued

▶ For *MARLO COIL CO.—H. DEWEY JONES*, president of the *H. DEWEY JONES CO.*, Columbus, Ohio, has been appointed representative for Marlo in the Columbus area.

▶ For *CLEAVER-BROOKS CO.—HAROLD R. WHITE CO.*, Baltimore, has been named manufacturer's representative. Located at 3600 4th St., Arundel Federal Bldg., Baltimore, its territory includes Washington, D.C., western Maryland, northern Virginia and several counties in West Virginia.

▶ For *INLAND STEEL PRODUCTS CO.—ROBERT E. DIETRICK* has been appointed sales representative in central Indiana.

▶ For *ROCKWELL MFG. CO.*, Meter and Valve Div. —*JACK H. WALTERS*, Houston district sales manager for the past few years, has been named gas products manager for the entire division and will make his headquarters at the company's home office in Pittsburgh. *THOMAS I. STACY* succeeds Mr. Walters in Houston.

▶ For *PENN CONTROLS, INC.—CONSOLIDATED CONTROLS CO.*, 225 Westlake North, Seattle, has been appointed warehousing agent in the Seattle territory.

▶ For *TRION, INC.—CLANCY W. POLLOCK*, formerly a Trion manufacturer's agent in Seattle, has been appointed western regional sales manager. Headquartered in Los Angeles, he will supervise offices in 11 western states.

▶ For *TUBULAR PRODUCTS DIV.* of the *BABCOCK & WILCOX CO.—G. H. WEIGHT* has been appointed southwest district sales manager and will have charge of the division's sales offices in Houston and Tulsa. His territory includes Texas, Oklahoma, Arkansas, Mississippi, Louisiana and southern Kansas.

▶ For *DeBOTHEZAT FANS DIV., AMERICAN MACHINE and METALS, INC.—WILCOX ENGINEERING CO.* is representing DeBothezat in Cincinnati and Dayton, Ohio, southern Ohio and northern Kentucky. The firm is located at 4200 Montgomery Rd., Cincinnati. Columbus, Ohio and the area east of that city is being covered by *UNITED EQUIPMENT CO.*, 539 E. Town St., Columbus.

WIREMOLD FLEXIBLE AIR DUCT

PROVED in the laboratory and on the job!

The Wiremold Company spent two years developing type 571A AIR DUCT before marketing it for flexible connections on high velocity air conditioning systems. All qualities including longevity, flame resistance, strength and durability were tested thoroughly.

WIREMOLD Flexible AIR DUCT has proved itself on the job by saving installation time and money. It is recommended by leading manufacturers of air distribution equipment and has been installed in many new commercial and industrial buildings.

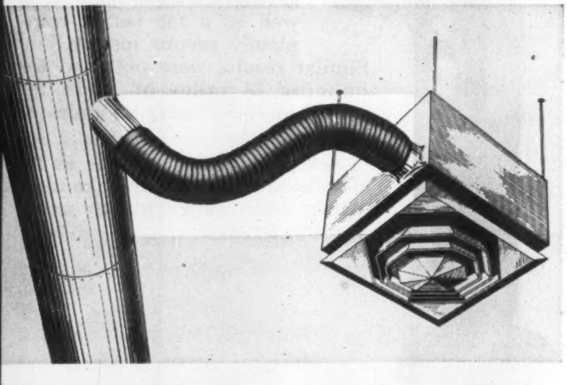
The Wiremold combination of tested materials and exclusive construction make it best for the job. There is no glue or adhesive to break down because a specially coated Fibreglas is *mechanically locked* into the supporting steel spiral.

- Extremely flexible
- Light weight but sturdily constructed
- Takes all bends without kinking
- Excellent air flow characteristics
- Waterproof . . . flame resistant

Sizes from 3" to 10", Inside Dimensions

BEST for the job

. . . in Commercial Air Conditioning Applications!



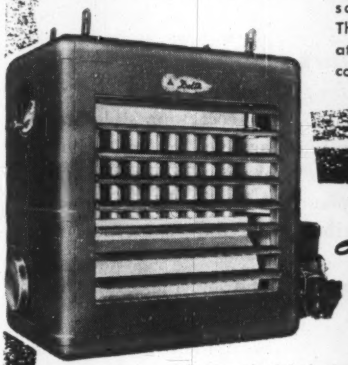
Get the complete story on WIREMOLD Flexible AIR DUCT. Write for Data Sheet S-3.

The WIREMOLD Company
HARTFORD 10, CONNECTICUT

PROBLEM:
"We need a new heating system, but can't afford an expensive one."

SOLUTION:
"We saved $6000 by installing **Delta OIL-FIRED UNIT HEATERS** in our plant!"

"We had neither the space nor the funds to install a complex boiler system . . . and the cost of gas in this area was too high for our budget. So we struggled along with inadequate heating . . . until Delta direct-fired Oil Unit Heaters solved our problem. They're doing a big job at an unbelievably low cost!"



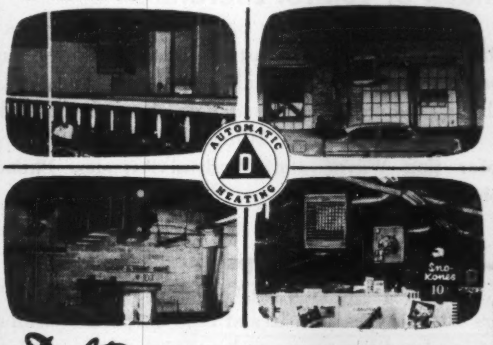
Delta
DIRECT-FIRED OIL UNIT HEATERS
fit everybody's budget, everybody's needs.

SIMPLEST TO INSTALL: Big savings on installation costs. They need no large chimney, boilers, pipes, fittings. Factory wired and assembled . . . just hang them up.

LOWEST COST OPERATION: Delta's powerful pressure oil burner does a most effective and efficient heating job on low cost #2 fuel oil. Maintenance is simple and seldom. Costs 50% less to operate than old-style systems.

GREATEST COMFORT: Within seconds the Delta Unit Heater bathes the entire working zone with comfortable, even heat . . . with no cold spots, no overheating. Ten sizes from 112,000 to 220,000 BTU/hr. to meet all situations.

On your next installation, let DELTA OIL UNIT HEATERS solve all your price and performance problems. Write today for information.



AUTOMATIC D HEATING

Delta HEATING CORPORATION
1 COLE STREET • TRENTON 8, N. J.

Cost Cutting Ideas from Lincoln

HOW TO SIMPLIFY PIPE INSTALLATION

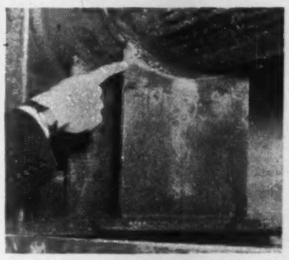


Fig. 1. Pipe Cradle Support *shop-fabricated from ¼" steel plate is used where pipes pass over girders. Note cross support "I" beam fillet welded to girder.*

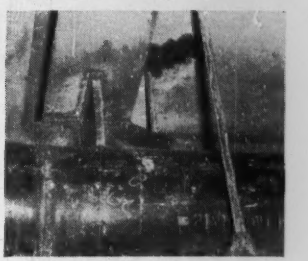


Fig. 2. Support for Risers *is fabricated from ¼" plate and fillet welded to pipe and to overhead "I" beam. Hanger shown at right is for initial installation of pipe only before risers are added.*

COST of installing steam lines can be cut by the use of simpler welded steel supports as shown above.

Components for pipe supports are flame cut from steel plates. For lowest cost, components are shop welded with fast down-hand techniques using Lincoln "Fleetweld 5" electrodes and "Shield-Arc" DC motor-generator welders.

Substantial reductions in cost of welding pipe are made possible with "Fleetweld 5" electrodes and "Shield-Arc" welders. Welds in flat, vertical and overhead positions are made faster . . . are more dependable for strength and freedom from pinholes.

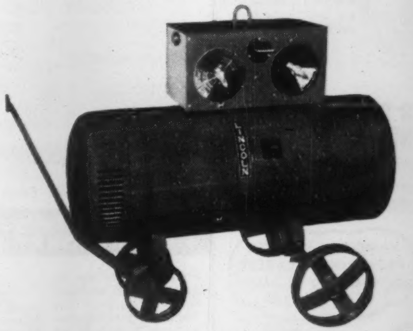


Fig. 3. Low Cost Performer *Lincoln "Shield-Arc" SAE motor-driven DC welder. Exclusive Dual Continuous Control gives right type arc and right arc intensity for every welding job . . . every welding position. Available in 200, 300, 400, 600 and 900 amp sizes.*

LOOK INTO THE FACTS
Benefits of lower costs on welding are in Lincoln Bulletin 1302 on "Shield-Arc" DC welders. Write to:

THE LINCOLN ELECTRIC COMPANY
Dept. 3805 • Cleveland 17, Ohio
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

LOOK JOE!...
NO MORE ROUGH, JAGGED OPENINGS in CONCRETE FLOORS
...SAVE Up to 50% with a ..... Clipper CONSAW

Save up to 50% in labor and material. Saw repair patches — saw gas, water, sewer and air line trenches in floors, runways and streets. Stops cracking and spalling — stops high maintenance costs.

It's Yours on...
FREE TRIAL

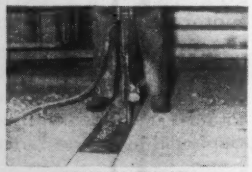
Discover how Clipper will increase profits by decreasing maintenance costs. "On the Job" FREE TRIAL guarantees you satisfaction at *no obligation!*

CLIPPER CONSAW

MODEL C-130
ONE OF 5 MODELS
GAS OR ELECTRIC
POWERED

OUR ONLY BUSINESS FOR NEARLY 20 YEARS ... MASONRY AND CONCRETE SAWING!

The unqualified Clipper guarantee of satisfaction is backed by world-wide experience, the ability to select the finest materials, and the "know-how" to put them together.



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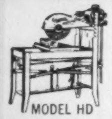
Every shape and size refractory **cut in seconds!** Perfect fitting reline jobs that last longer—cost less. A Clipper Model to fit any job—any budget. SOLD on FREE TRIAL!



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15 MODELS PRICED FROM $265

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☐ CLIPPER DIAMOND BLADES

No. 16-CI

COMPANY ____________________
ADDRESS ____________________
CITY ____________ STATE ______

RECENT TRADE LITERATURE...

Air Conditioning Equipment

Folder covers a central station air conditioning unit for large installations and another bulletin describes and illustrates air cooled equipment, including condensing units, packaged units, etc. The central unit is available in an evaporative condenser model (compressor, coils, condenser, blowers, filters and controls in one package) in capacities of 8750, 14,000 and 21,000 cfm, and a water cooled model with an additional 35,000 cfm capacity. Air cooled equipment includes a 5 hp condensing unit and complete units containing all components. Application drawings are offered and all equipment is illustrated.

Manufacturer—Chrysler Airtemp, Div. of Chrysler Corp., 1600 Webster St., Dayton 1.

Automatic Boilers

Have You Checked Your Steam Costs Lately? is title of 16 page cartoon style booklet presenting "Powermaster" packaged automatic boilers. In the first part of the book drawings and captions emphasize typical plant problems. The latter part illustrates and describes many different types of installations.

Manufacturer—Orr & Sembower, Inc, Morgantown Rd., Reading, Pa.

Heating, Air Conditioning Equipment

New and improved heating, air conditioning, ventilating and heat transfer equipment briefly described in product bulletin PB-290. Shown are various types of compressors, self contained air conditioning units, fin coils, baseboard convectors, and other products.

Manufacturer—The Trane Co., La Crosse, Wis. (Request bulletin on company letterhead.)

Index of Control Literature

Twelve page Bulletin 100-C lists all the manufacturer's Industrial Div. literature. Numbers and titles of all catalogs, bulletins, specification sheets, and instrumentation data sheets are included.

Manufacturer—The Minneapolis-Honeywell Regulator Co., Wayne and Windrim Avenues, Philadelphia 44.

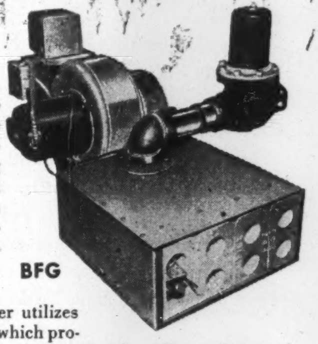
Line Support Clamps

New 201G *Engineering Manual* covers 40,000 types and sizes of bare metal and cushioned or insulated line support clamps, wire harness clamps and multiple support clamps. It also covers related items, including brackets, busbars and laminated anchor nut or reinforcing shims. Manual contains 68

Why So Many Heating Engineers SPECIFY

Power-Flame BURNERS

You'll find a Power-Flame Burner engineered to insure peak efficiency for EVERY Commercial, Industrial or Domestic Application.

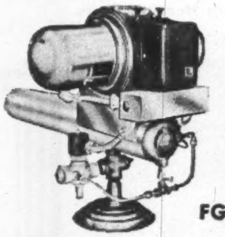


BFG

Regardless of application, whether it be straight gas or combination gas-oil, heating engineers know that Power-Flame burners supply fuel-saving, easy-to-install, high-efficiency heating.

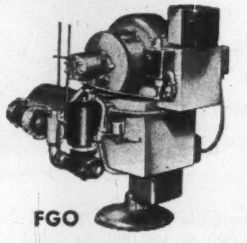
Every Power-Flame burner utilizes quiet, amply-sized blowers which provide balanced air mixture, eliminating the effects of natural draft conditions, and thus, providing metered air for complete combustion and highest heating plant efficiencies even in down-draft boilers or furnaces.

BFG Series (pictured above), 8 models in capacities from 450,000 BTU to 9,000,000 BTU input. With these features... factory wired—controls and valves mounted...wired sequencing panel provide purge period for utmost safety...positive control of air for combustion...dollar for dollar, the industry's best buy.



FG

FG Series 3 gun type units—Model FG 175, capacity 175,000 BTU, AGA listed; Model FG 330, capacity 330,000 BTU, AGA listed; model FG 500, 500,000 BTU. Ideal for replacement of oil burner... serves a wide range of hard-to-fire applications.



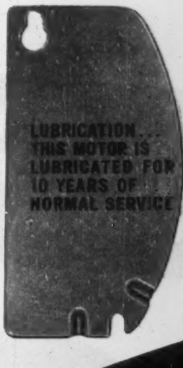
FGO

FGO Series—Combination Gas-Oil—6 models in capacity to 3,500,000 BTU input. Features include...automatic ignition for BOTH fuels...automatic air adjustment...electronic safeguard...factory assembled and tested for both gas and oil. Automatic or manual changeover optional.

A Power-Flame dealership can be valuable. Write today for complete information.

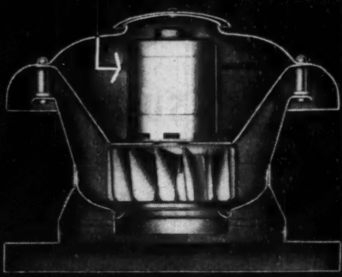
Siemon Power-Flame BURNER Manufacturing Co.

1819 HOLMES DEPT. HP KANSAS CITY, MO.



Look for this name plate. It is your guarantee of protection on a Jenn-Air Exhauster motor

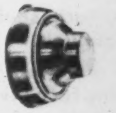
Set it...forget it for 10 YEARS



Now Jenn-Air Low Contour Exhauster Motors are Lubricated for 10 Years of Service

Once a Jenn-Air Exhauster is set in a wall or on a roof, you can forget maintenance, because the motor is lubricated for 10 years of normal service. Since the bearing is the heart of any motor, you know this vital part is adequately protected in a Jenn-Air Exhauster. This is another feature by Jenn-Air, which has been FIRST with spun aluminum, rust-proof construction, no painting necessary; FIRST with simplicity of installation and ease of cleaning. Exclusive dual low-contour design means beauty that blends with today's modern architecture. It means fitting ventilation needs to the building which adds up to savings in labor and maintenance. Consult Jenn-Air Ventilating Specialists on ventilating problems.

Low contour Roof Exhausters blend with architectural design of building



Wall Exhausters—architecturally sculptured button design-spots ventilation control

JENN-AIR PRODUCTS COMPANY, INC.
Architects & Builders Building
Indianapolis 4, Indiana

Jenn-Air Products Company, Inc.
Architects & Builders Building, Indianapolis 4, Indiana
Please send me your free catalog 53B.

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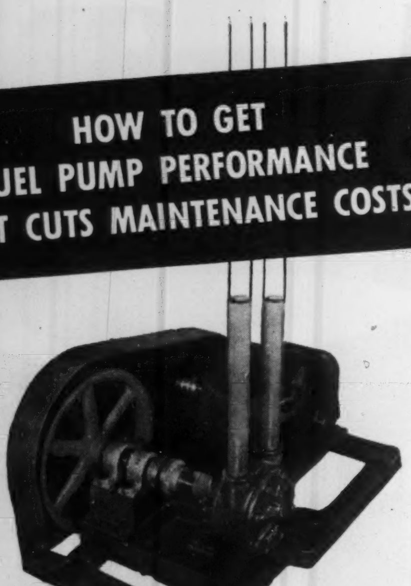
City____________ State_______ HPAC

HOW TO GET
FUEL PUMP PERFORMANCE
THAT CUTS MAINTENANCE COSTS



Install

TUTHILL TYPE SU *Pumping Units*

For Dependable Service in Industrial Heating

Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages for dependable, uninterrupted operation that add up to reduced maintenance expense.

Features like these make the SU outstanding for handling heavy fuel oils in industrial heating:

- ★ **Motors up to 5 h.p. mounted on slotted slide rails for easy adjustment or replacement. No drilling or tapping required.**
- ★ **Cast iron base with mounting bolts and adjustments easily accessible.**
- ★ **One-point belt-tension adjustment.**
- ★ **Jack shaft, supported by ball-bearing pillow blocks, carries entire weight of pulley and absorbs belt tension.**
- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Pump and jack shaft direct-connected by flexible coupling for better alignment and simplified mounting.**
- ★ **Wide range of pump models and capacities.**

Complete data is presented in Tuthill Catalog No. 107. Write for your copy today.

TUTHILL PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Pumps since 1927
939 East 95th St., Chicago 19, Illinois
Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

loose leaf pages, plastic bound. It gives 112 detailed prints and complete specifications covering materials and finishes in aluminum, steel and stainless steel.

Manufacturer—Thomas Associates, 4607 Alger St., Los Angeles 39.

Motors and Controls

Form 943 condensed data sheet and price list covers squirrel cage induction motors, wound rotor induction motors, direct current motors, gear motors, single phase motors (including split phase, capacitor start and repulsion start induction types), and motor controls. This list replaces that dated June 1, 1954.

Manufacturer—Century Electric Co., 1806 Pine St., St. Louis 3.

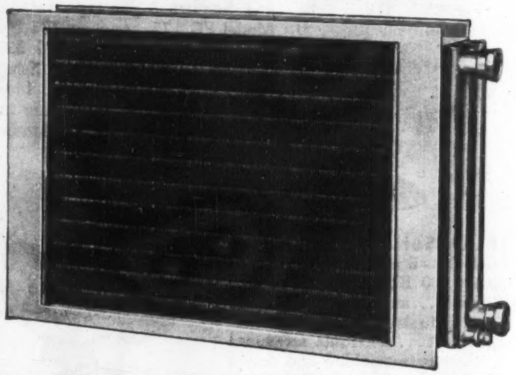
Oil-Gas Burners

Horizontal rotary-nozzle mix type, described and illustrated in new four page bulletin No. 176. Specifications, electrical characteristics and standard and extra equipment are listed.

Manufacturer—The Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23.

New . . . REMPE "Hi-Cap" STEAM HEATING COILS WITH DEFROSTER

For Use In Combination With Air Conditioning Coils Or As Tempering and Booster Units in Long Heating Ducts.



Available in Single Row Type with BTU per hour capacity from 60,000 to 360,000. In Double Row Type, for heavy duty service, in capacities from 129,000 to 775,000 BTU per hour. Heavy gauge steel casings. Copper tubes and headers. Tested 350 lbs. air pressure for steam working pressures up to 125 lbs. Defroster-standard equipment. Also suitable for hot water.

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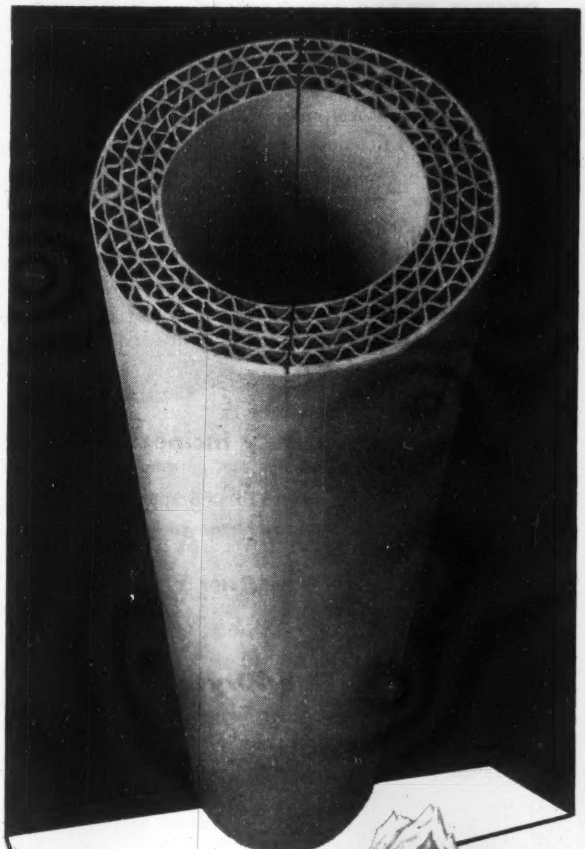
HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890

REMPE COMPANY

342 N. Sacramento Blvd., Chicago 12, Ill.

Complete facilities for fabrication of pipe coils—all types—all materials. Engineering service. Send details for price.



Sal-Mo
ASBESTOS PRODUCTS

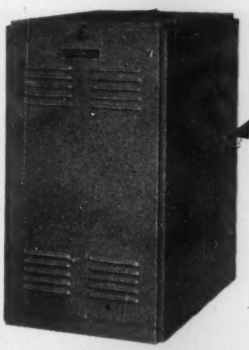
CHOOSE your pipe coverings with care . . .
pick the type best suited to the job . . .
but, for dependable quality and fast service,
be sure your choice is Sal-Mo.

Sal-Mo Pipe Coverings are available in any size, any type—Aircell (shown in photo above), Sixcell and Multicell, Anti-Sweat, Alaska Frostproof, Sponged Felt, Wool Felt (single and double shell). They are made to the most exacting standards, to insure perfect fit and maximum efficiency. Since, in most cases, Sal-Mo Pipe Coverings sell for no more than others, don't simply order "pipe coverings." Specify, and insist on getting, Sal-Mo!

Sheets, blocks and boiler and tank insulation available in all types for all applications.

Order from your jobber, or write for complete catalogue and name of nearest jobber.

SALL MOUNTAIN
COMPANY
HAMILTON, OHIO

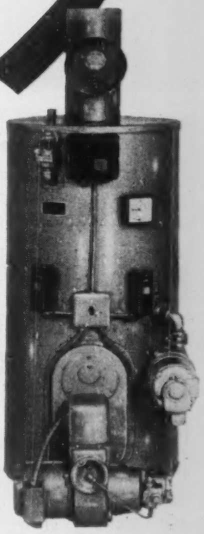


Enclosed find the Famous ALDRICH Boiler-Burner

• Always ahead in efficiency and economy, now the Gulf Stream is up to the minute in style, too. Choice of 5 sizes, with net ratings of 66,000 to 168,000 BTU per hour. Home owners have a choice—the space-saving "package" or standard model, with all controls and accessories easily accessible, or the Gulf Stream completely enclosed in a streamlined housing.

Ruggedly and simply built, the Gulf Stream picks up the heating load with immediate response. Special multiple-flue tube construction affords maximum heat extraction and quick transfer of heat to the boiler water.

With the tankless hot water coil added, the unit furnishes not only heat but hot water supply as well. Write for complete details.



Gulf Stream
PACKAGE
Fully erected, pre-wired, accessory-equipped. Ready to set in place and connect. Easy to install and service.

GULF STREAM Standard
Comes fully erected, equipped with a complete set of automatic controls for 115 volt, 60 cycle operation, including thermostat, stack switch and limit control. Combustion chamber is installed. Top jacket removable without disconnecting water piping.

HOT WATER HEATERS
Internally galvanized, high delivery direct heating, no slow storage. **SERIES "B"**—93 to 850 GPH at 100° F. rise. **SERIES "C"**—100 to 255 GPH at 100° F. rise.

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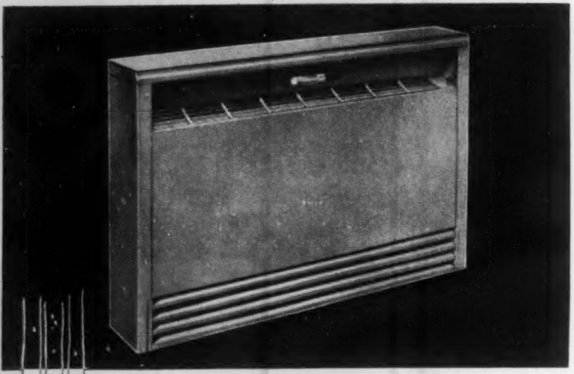
ALDRICH COMPANY
105 WILLIAMS STREET • WYOMING, ILLINOIS
A SUBSIDIARY OF BREEZE CORPORATIONS, INC.



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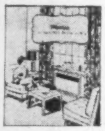
Superb performance

When top architects and heating engineers want the finest in modern heating, they specify Modine Convector Radiation. Here's an unmatched combination of beauty, long life and uniform, healthful heating. Ask your Modine representative for full information — he's listed in the classified section of your phone book. Or write for Bulletin SA-54, Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.



R-1232

Modine
convector radiation

RECENT TRADE LITERATURE

Continued

Packaged Boilers

Automatic, 20 to 500 hp. A new four page bulletin BE-4 describes the operation and advantages of the "Continental" automatic boiler's "spinning gas technique," called a method of obtaining maximum heat transfer with a simplified design. Bulletin shows cut-away view of construction; illustrates hinged doors; and shows the method of injecting air through static, turbine-like vanes into the burner.

Manufacturer—The Boiler Engineering & Supply Co., Inc., Phoenixville, Pa.

Portable, Heavy Duty Incinerators

Clearly and concisely described in two page circular giving tabulated specifications and installation tips. Incinerator sizes range from ½ bu to 10 ton units.

Manufacturer—The Incinerator Products Co., 687 S. Post, Detroit 17.

Refrigeration Filter-Dryer

New four page bulletin illustrates and describes the improved "Model 410 Trap-Dri," a combination filter and drier. This combination pro-

HANDLE COAL AUTOMATICALLY!

"TAKE IT UP A FLO-TUBE"®

CANTON STOKERS

The spiral conveyor of steady, dependable service. Sturdy cast iron trough bolts together in 3 ft. sections, capped with steel plates for easy removal if ever necessary. Built to take the abuse of coal, yet with tolerances just right to handle materials from grain size to lump.

To fill 3 or more hoppers use gate-valves in Flo-Tube horizontally. Below, filling 2 hoppers with "Y" chute.

Hopper level maintained by 'off-on' automatic switches.

Exposed end for pick-up

CANTON STOKER CORP.

SPECIALISTS IN AUTOMATIC COAL FIRING, HANDLING AND CONTROL EQUIPMENT
2400 ANDREW PLACE S. W. • CANTON, OHIO

HERE'S A PARTIAL LIST OF FLO-TUBE INSTALLATIONS . . . YOU MAY WISH TO VISIT AND INSPECT ONE NEAR YOU—

	NO. IN SERVICE
HIGH SCHOOLS, COLLEGES:	
Hereford Jr.-Sr. High School, Hereford, Maryland	2
North High School, Akron, Ohio	2
St. Mary's Czest School, Milwaukee, Wisconsin	1
Robert A. Taft High School, Cincinnati, Ohio	2
Sacred Heart Seminary, Detroit, Michigan	1
Frostburg State Teachers College, Frostburg, Maryland	1
Sisters of Good Shepherd, Indianapolis, Indiana	1
Hillsboro High School, Hillsboro, Missouri	2
Ambridge High School, Ambridge, Pennsylvania	1
School No. 215, Baltimore, Maryland	2
HOSPITALS:	
Charleroi-Monessen Hospital, N. Charleroi, Pennsylvania	1
St. Elizabeht's Hospital, Youngstown, Ohio	1
Miners Hospital, Frostburg, Maryland	2
APARTMENTS, BUILDINGS:	
Laird Building, Tiffin, Ohio	1
Montgomery Gardens Apartments, Jersey City, New Jersey	2
Russell Lamson Hotel, Waterloo, Iowa	1
INDUSTRIAL PLANTS:	
Sugardale Provision Company, Canton, Ohio	1
Cincinnati Shaper Company, Cincinnati, Ohio	2
Cooper Tire & Rubber Company, Findlay, Ohio	1
Beckett Bronze Company, Muncie, Indiana	1
A. Gross & Son, Newark, New Jersey	1
Milwaukee Asphalt Plant, Milwaukee, Wisconsin	2
GREENHOUSES:	
E. A. Dreger Greenhouse, Cleveland, Ohio	1
M. F. Cutting & Sons Greenhouse, Cleveland, Ohio	1
Thomas F. Browne Greenhouse, Detroit, Michigan	2
Boyert Bros. Greenhouse, Cleveland, Ohio	1
Ray Fitkin Bros., Sylvania, Ohio	1
Jensen's Greenhouse, Warren, Ohio	1
Dulabahn's Florists, Canton, Ohio	1
Berea Greenhouse Company, Berea, Ohio	2
Patterson Flowers, Shelby, North Carolina	1
United Greenhouse Company, Cleveland, Ohio	3
A. C. Radke Greenhouse, Cleveland, Ohio	1
Bunker Hill Greenhouse, Medina, Ohio	1
DAIRIES, BREWERIES:	
Miller Dairy Farms, Eaton Rapids, Michigan	1
United Dairy Company, Lodi, Ohio	1
Lake to Lake Dairy Corp., Kiel, Wisconsin	1
Schoenling Brewery, Cincinnati, Ohio	1

ANOTHER d-h "PLUS!"

"HOT DIP" Galvanizing

AFTER FABRICATION ON ALL

PERMA-FAN

EVAPORATIVE CONDENSERS

A NEW D-H JOB:
Edison Company business offices, Ontario, California
PF-304

Installation by Key Refrigeration, Los Angeles.

IT'S SERVICE-FREE PERFORMANCE with Perma-Fans—ever since D-H pioneered the blow-thru principle of operation, back in 1937!

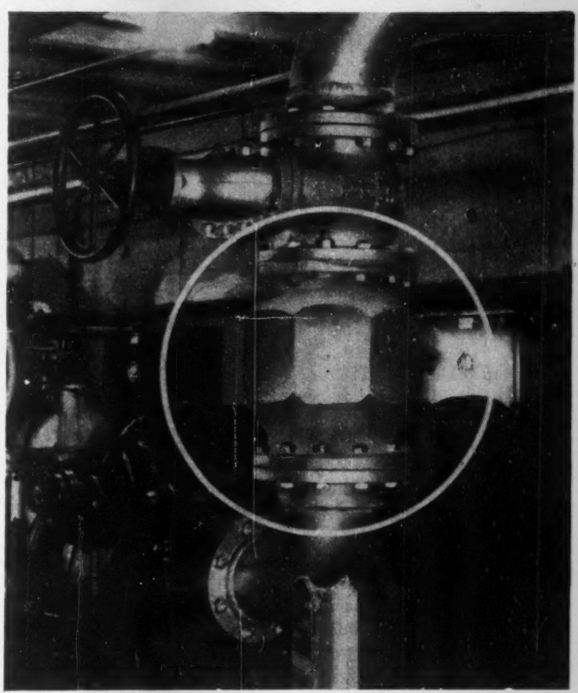
NOW, new and proven advances give you an expanded Perma-Fan line:

- In tonnage ratings from 5 to 105
- For indoor or outdoor installation
- Choice of refrigerants: Freon, Ammonia
- "Hot Dip" galvanizing on ALL surfaces

Particulars? Request Catalog PF C-3.30.

d-h SINCE 1910

drayer-hanson
INCORPORATED
3301 MEDFORD STREET, LOS ANGELES 63, CALIFORNIA
(A Subsidiary of United States Radiator Corporation)



10" MILLER VALVE INSTALLED IN MIDWESTERN DEPARTMENT STORE

MILLER

NOISELESS — NON-SLAM
CENTER GUIDED CHECK VALVE

SHOCK-PROOF
ELIMINATES WATER HAMMER

FULL RADIAL FLOW
MINIMUM PRESSURE LOSS
SIZES 1" THROUGH 24" FLANGED
SEMI-STEEL — CAST STEEL — ALLOYS
PRESSURES 125 LBS. TO 2500 LBS.
YOU CAN DEPEND ON A
MILLER CHECK VALVE
IT IS THE **BEST**

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NOT
GUESSES

Install BUILDERS SHUNTFLO STEAM METERS right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2" to 14" lines — Model SMDH for 1" and 1½" lines. Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC. BIF METERS FEEDERS CONTROLS

RECENT TRADE LITERATURE

Continued

tects six ways, says the manufacturer: 1) adsorption of harmful acids; 2) depth filtration; 3) removal of more moisture; 4) no chemical reaction in the refrigeration system; 5) no appreciable pressure drop; 6) hermetically sealed construction. The catalog furnishes dimensions, installation data, construction features, and application information.

Manufacturer—The A-P Controls Corp., 2450 N. 32nd St., Milwaukee 45.

Stainless Steel Fittings

Four page brochure illustrates fittings and describes new centrifugal casting method which cuts production costs 15 percent, the manufacturer says, and speeds deliveries.

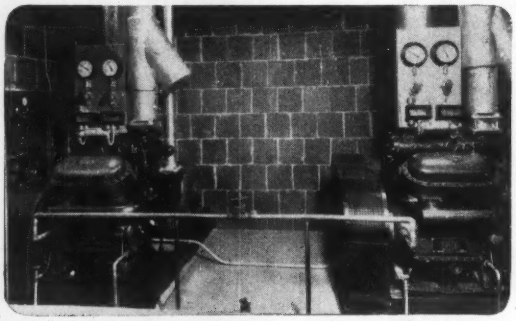
Manufacturer—Industrial Research Laboratories, 961 E. Slauson Ave., Los Angeles.

Threading Stainless Steel

Folder TDC 147, *Helpful Hints on Hand Threading Stainless Steel Pipe and Tubing*, discusses die stock, dies, speed, cutting oils and the assembly of threaded joints.

Manufacturer—Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa.

Frick "ECLIPSE" compressors, like these installed in the Constitution Bldg., have 2, 3, 4, 6, or 9 cylinders.



This 5-hp. Frick unit air conditioner is equipped with duct work to condition the retail store of the Georgia Power Co.

Constitution Building, Atlanta, Installs FRICK Air Conditioning Throughout

This modern building, occupied by the Georgia Power Co., now enjoys year 'round air conditioning.
The main cooling load is carried on a "central station" basis by four Frick "ECLIPSE" compressors: two of these are installed in a penthouse, and the others on the fourth floor.
In addition, Frick unit air conditioners of 5 and 7½ hp. serve the retail store on the street level, and the executive suite on the fourth floor. Operation of both types of systems is very satisfactory.
Whether you are an owner, architect, builder, heating contractor, or refrigeration distributor, we have air conditioning equipment and services of interest to you. Write for literature, estimates, or dealer contracts today: certain good territories still open.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK Co.
WAYNESBORO, PENNA. U.S.A.

YOU WILL FIND
MANY PROFITABLE IDEAS
IN PHILADELPHIA

Dec. 2-3-4-6-7
1954

21st NATIONAL POWER SHOW

NATIONAL EXPOSITION OF
POWER AND MECHANICAL ENGINEERING

COMMERCIAL MUSEUM—PHILADELPHIA

Five fact-filled days at the Power Show can save you months of tiresome and expensive research by providing the ideas for your improved plant operation.

Visit the technically staffed booths of the country's leading manufacturers of mechanical, steam, electrical, hydraulic and pneumatic power equipment and for the latest word in power technology.

You will learn how to increase production, improve product design and reduce maintenance costs at a minimum expenditure of your valuable time.

PLAN NOW TO ATTEND

Write early for hotel reservations and advance registration

Under the auspices of the ASME

Management: International Exposition Co.
480 Lexington Avenue, New York 17, N. Y.

NOW

A Brand New Profit-Maker for Heating Contractors

THERMOBLOC
TYPE AF
2 MILLION BTU
DIRECT-FIRED HEATER

- ***Easy to Sell***
- ***Easy to Install***
- ***Quick Profits***

Check these fast selling features! Easy to install. Occupies comparatively small space . . . heats up to approximately 24,000 sq. ft. . . . circulates an even blanket of heat directly at working level or through air ducts. The new THERMOBLOC Type AF is a premium heater designed for unlimited industrial applications!

No other direct-fired heater has THERMOBLOC'S exclusive design and boiler-type construction features. THERMOBLOC presents a new concept of heat transfer efficiency . . . engineered and developed to heat large open areas in warehouses, factories, commercial garages, machine shops, and similar hard-to-heat buildings. THERMOBLOC is industry's answer for low-cost and highly efficient heat.

Send coupon for complete details on how you can profit on your next heating job by installing THERMOBLOC.

THERMOBLOC
DIVISION OF
PRAT-DANIEL CORP.
5-10 MEADOW ST. SOUTH NORWALK, CONN.

PRAT-DANIEL CORP.
5-10 Meadow St.
South Norwalk, Conn.

☐ Please rush Bulletin 5/54 on the new, easy to install Model AF 2000.
☐ I would like more information on a dealership.

Name...Title..................
Company...
Address...
City...State..................

Problem:
Venting aggressive fumes
Solution:
Transite®
Industrial Vent Pipe
the asbestos-cement pipe that defies corrosive vapors

Under severe service conditions such as this chemical plant encounters every day, Transite Industrial Vent Pipe has proven its high resistance to aggressive fumes. In numerous installations, it has conveyed such fumes for periods up to 20 years and more, often outlasting, many times over, the materials previously used.

Because it is made of asbestos and cement, Transite Pipe cannot rust nor rot. Resistant to many corrosive fumes, vapors and dusts encountered in industry, it assures long service life. Whether used indoors or out, it needs no painting or other protective coating. Stands up under diverse weather conditions.

Transite Industrial Vent Pipe is easy to install. Light in weight, it is handled readily—can be cut on the job without special equipment. Its wide range of sizes, and complete line of fittings make it adaptable to almost every industrial venting service.

For additional information about the use of Transite Industrial Vent Pipe for your venting problems write to Johns-Manville, Box 60, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville
TRANSITE INDUSTRIAL VENT **PIPE**

RECENT TRADE LITERATURE *Continued*

Temperature Measurement

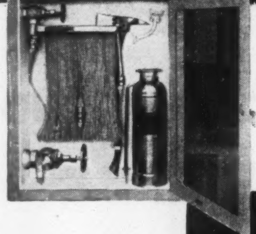
How Temperatures Are Measured, by Dr. G. M. Volten, an eight page reprint. Some of the topics are: Heat and temperature as separate concepts; history of the commonly used scales for measuring temperatures; physical effects associated with a rise in temperature, and how thermometers and pyrometers utilize some of these effects; and monitoring surface temperature by means of changes in color or physical state.

Manufacturer—The Tempil Corp., 11 West 35th St., New York 10.

Transmission Belts

"Poly-V, drive" belt power transmission is described in a new folder, No. 6638. Design characteristics of the single, endless belt with molded lengthwise ribs, are explained in two-color line drawings. The drive gives large contact area, more horsepower, eliminates matching, reduces face pressure, maintains constant effective pitch diameter under shock loads, allows short centers, and reduces inventory of both belts and sheaves, states the manufacturer.

Manufacturer—Manhattan Rubber Div., Raybestos-Manhattan, Inc. Passaic, N. J.


Best for Clients
PROVED RELIABLE, ECONOMICAL

ALLENCO
INTERIOR
FIRE-PROTECTION EQUIPMENT
Complete Line — 480 Cabinets Alone
Modern, Most Widely Used

Easiest for you
Reliable Delivery—
Goes in Easier

SINCE 1887
W. D. ALLEN
Manufacturing Co.
CHICAGO 6 • NEW YORK 7

Hospital in Montgomery, Alabama, equipped with No. 5 Lo-BLAST Burner

FOR EVERY TYPE OF BUILDING

LO-BLAST

IS THE GAS HEATING "BUY"

From coast to coast, you'll find Lo-BLAST Power-type Conversion Gas Burners heating buildings ranging from small residences to entire villages heated from a central plant. Preference for Lo-BLAST springs from proved efficiency, safety, durability . . . *operating records show an average saving of* 10%!

Compare these operating and construction features:

Power Burner Design. Perfect combustion, regardless of draft—a proved fuel saver. Safe and efficient for down-draft units.

Simple to Install. Every Lo-BLAST is factory tested on gas and shipped assembled.

Safe Operation. Lo-BLAST comes equipped with dependable, foolproof safetys.

Soft, Quiet Flame. No "pop" when the Lo-BLAST goes on or off—burns so smoothly you can hardly tell it's running.

Easy to Service. All parts are accessible—nothing in the firebox but the fire. Simplicity of design and durable construction reduce service to a minimum.

Long Lasting. Many Lo-BLAST Burners have been in operation 15 years without service.

Complete Capacity Range. Units available from 70,000 to 20,000,000 BTU input.

Lo-BLAST Economite

The "mighty-mite" of conversion gas burners—capacities from 70,000 to 500,000 BTU. All the famous design features of the larger Lo-BLAST packed into a low-cost unit for residential use. Write for descriptive literature.

This battery of Lo-BLAST Burners handles 11,000 sq. ft. of steam radiation plus 10,000 gallons of hot water per day.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

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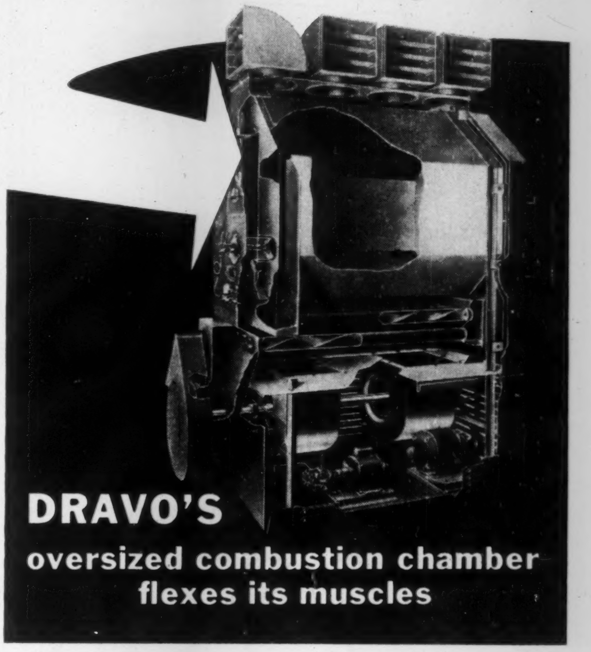
another DRAVO HEATER plus



DRAVO'S
oversized combustion chamber flexes its muscles

Dravo's stainless steel combustion chamber is widely imitated, but the extra value that Dravo engineering gives you is still an exclusive "*plus*."

OVERSIZE . . . Dravo's *larger* combustion chamber delivers rated output, with metal temperatures never exceeding ½ to ¾ of scaling temperatures. Result . . . longer service life for you.

FLEXES ITS MUSCLES . . . The floating feature allows Dravo's combustion chamber to freely expand and contract, eliminating dangerous stresses and strains. Special supports permit the unit to be mounted in any position.

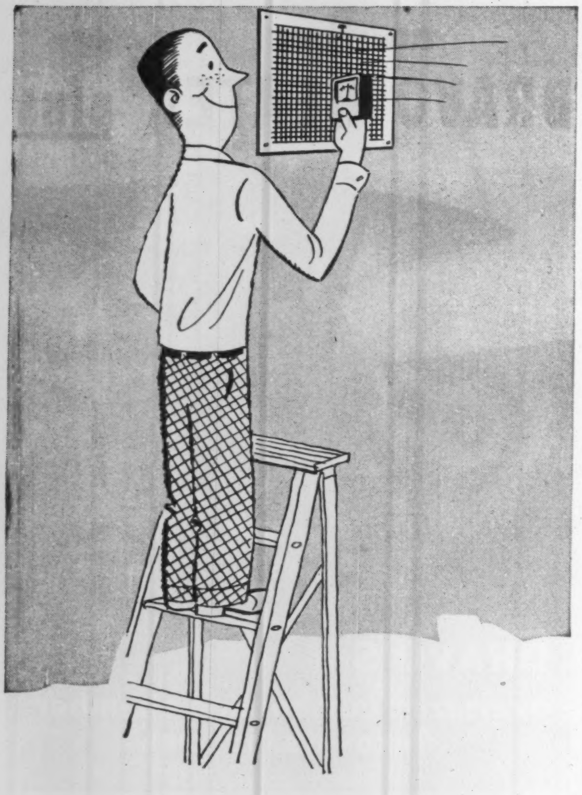
Couple these features with the many other advantages offered by Dravo Heaters and you see why dollar for dollar, year for year, your best heating investment is Dravo Heaters.

Mail the coupon for more information.

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.
Please send me complete information about the Dravo:

☐ ***Counterflo*** **Space Heater 400,000 to 2,000,000 Btu/hr. output**
☐ ***Paraflo*** **Space Heater 200,000 to 250,000 Btu/hr. output**
☐ ***Gas Fired*** **Unit Heater 88,000 to 160,000 Btu/hr. output**
☐ Please have a representative call at no obligation to me. Ask for Bulletin JK 598-9102.

Name________________ Title________
Company________________
Address________________
City________________ Zone____ State________



Balancing Air Supply a Problem?

. . . then you need the fast, accurate air velocity readings you get with an Alnor Velometer Jr. This palm-size instrument takes the expensive guesswork out of balancing systems and speeds up adjustment of any air conditioning, heating, and–or ventilating set-up.

The Velometer Jr. is a miniature, direct-reading air-velocity meter that's precision built for lasting accuracy. It has double-pivoted, double-jeweled movement, air-actuated pointer vane, and sturdy molded Bakelite case. Available with single or double velocity range scales, Velometer Jr. can be one of your most useful tools for years to come. Send today for complete details. Illinois Testing Laboratories, Inc., Rm. 513, 420 N. La Salle Street, Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS
FOR EVERY INDUSTRY

NEW BOOKS & REPORTS . . .

Cooling Plants for Mines

The problem of adequately ventilating the working face in mines was covered in an article, *Cooling Plants for Underground Workings in Belgium,* in a recent issue of the *Journal the Institution of Heating and Ventilating Engineers.* The author, Andre Houberechts, a professor at the University of Louvain and director of the Institute of Mining and Hygiene, discusses the factors influencing the air conditions in coal mines.

The Institution of Heating and Ventilating Engineers is located at 49 Cadogan Sq., London, S. W. 1.

Corrosion Survey

The *Bibliographic Survey of Corrosion—1948-1949* is the third in a series which covers corrosion literature for the five year period 1945-1949. The 346 page book contains 3512 abstracts of articles and books on corrosion. The articles are from more than 500 periodicals published all over the world and are abstracted by some 30 agencies that authorize the publishers to use their abstracts.

Copies of the book are available from the National Association of Corrosion Engineers, 1061 M & M Bldg., Houston 2. It is priced at $12.50 a copy for non-members of the association and $10.00 for members.

Aluminum Alloy Designations

A new system of alloy designations for wrought aluminum and aluminum alloys has been developed by the Aluminum Association and became effective on October 1. A booklet, *The Aluminum Association Alloy Designation System for Wrought Aluminum,* describes the system in detail. Consisting of four-digit numbers, the new system is expected to meet all of the industry's present and future needs for wrought alloys.

The Aluminum Association is at 420 Lexington Ave., New York 17.

Manual for Plant Engineers

Plant Engineer's Easy Problem Solver has been written specifically to help engineering personnel save time in solving problems that frequently arise in their work. According to the author, Louis J. Murphy, "it is a practical book dealing with the shortest and quickest way of going from raw data to the accurate solution of an equation involving these data." There are sections on heating, ventilating and air conditioning, refrigeration, pipe and piping systems, pumps and pumping equipment, etc.

The book is priced at $6.00 and may be ordered from the Book Div. of Conover-Mast Publications, Inc., 205 E. 42nd St., New York.

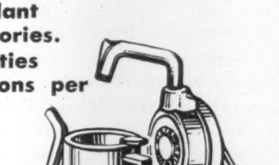
LIQUID MATERIALS HANDLING

Handy Pump
says

"To keep your plant safe and clean use BLACKMER Hand Pumps"

Check these valuable features!

- ✓ Easy rotary pumping action.
- ✓ Famous "Self-Adjusting for Wear" Design.
- ✓ Surplus liquid return eliminates spillage and waste.
- ✓ Positive displacement for positive control.
- ✓ Wide range of "plant engineered" accessories.
- ✓ Available in capacities from 7 to 28 gallons per minute.



call your local representative or write the factory for information

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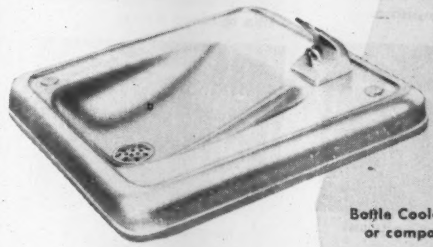
BLACKMER

Industrial, Hand and Truck Pumps, Strainers, Pressure Control Valves
BLACKMER PUMP COMPANY, GRAND RAPIDS 9, MICH.
DIVISION SALES OFFICES — NEW YORK • ATLANTA • CHICAGO
GRAND RAPIDS • DALLAS • WASHINGTON • SAN FRANCISCO
See Yellow pages for your local sales representative

Temprite



WITH THE

DEEP

STAINLESS STEEL

TOP

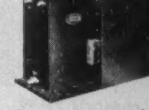
EVERYTHING about the beautiful Temprite Water Cooler is generous, substantial, sturdy! The sanitary stainless steel top is *extra deep* . . . the anti-splash guard *extra full* . . . The flow of cool water won't splash, won't spurt, won't find its way on to the surrounding floor!

Dismantle the Temprite, if you wish; look inside and you will see the fully corrosion resistant cooling system, the *extra strong* all-welded steel frame, and *heavy gauge* sheet steel cabinet panels. Built for years of service. The compressor is hermetically sealed and lubricated for life. Everything about the Temprite line spells *EXTRA* QUALITY!

Pressure Bubbler Coolers in Nine Models.

Bottle Coolers in standard or compartment type.

Bubbler type compartment coolers



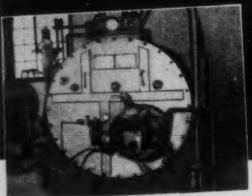
Remote type coolers in three sizes.

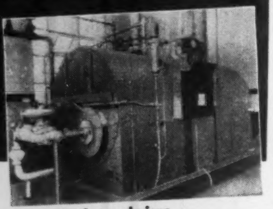
Temprite accessories include wall fountains, glass fillers, transformers, optional push-button control assembly, etc.

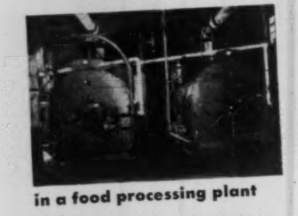
Since 1929
Temprite
PRODUCTS CORPORATION

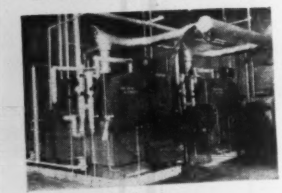
P.O. BOX 72-L
EAST MAPLE RD.
BIRMINGHAM
MICH.

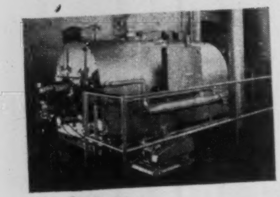
Dutton EconoTHERM
EARNS OWNER PRAISE

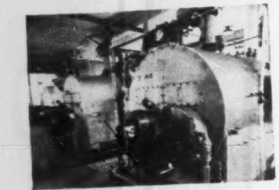

in a railroad roundhouse

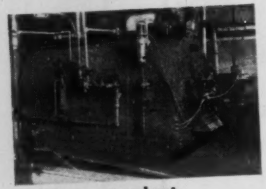

in a modern dairy

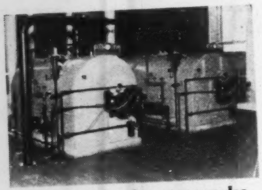

in a food processing plant


in a hospital


in a factory


in an institution


in a concrete plant


in a municipal waterworks

AND HERE'S WHY!

Verbally and by mail* owners have enthusiastically reported big savings in fuel, labor and space — often all three — thanks to EconoTHERM's efficient Off-center Firing, Rotary Combustion and Automatic Operation.

EconoTHERM gives quick steam with greater safety . . . saves fuel, labor and maintenance expense. Gas or oil fired, sizes are available to 250 H.P.

Get all the facts on the Dutton EconoTHERM's compact, modern packaged design and automatic operating features. See how it can satisfy your steam needs and save *you* money!

*Ask to see the letters!

Write for EconoTherm Bulletin EC-52G

✓ CHECK FIRST with Dutton

Dutton BOILERS
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO, MICHIGAN • BOILER BUILDERS SINCE 1880
FOUR TYPES SIZES FROM 5 TO 250 H.P.

MEETINGS & CONVENTIONS . . .

AMERICAN GAS ASSOCIATION, 420 Lexington Ave., New York 17—36th annual convention, October 11-13, Atlantic City, N.J. Programs have been arranged for the association's Operating Section, Accounting, Home Service, General Management, and Industrial and Commercial Sections.

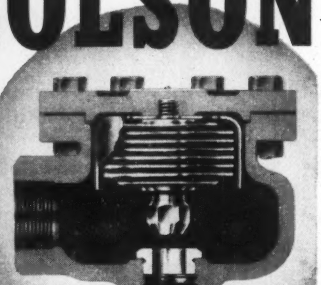
EIGHTH NATIONAL CHEMICAL EXPOSITION, The American Chemical Society, Chicago Section, 86 E. Randolph St., Chicago 1—Chicago Coliseum, October 12-15. Theme of the exposition is "The Chemical Industry in Everyday Living."

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 1061 M & M Bldg., Houston—meeting of South Central Region, October 14-15, Dallas. Symposiums will be presented on cathodic protection, protective coatings, inhibitors, processing plant corrosion problems, pipe line corrosion and oil and gas production.

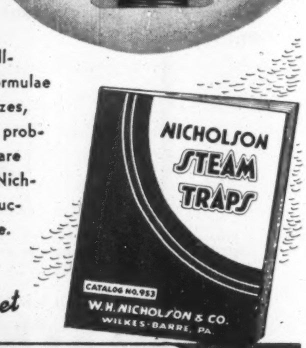
NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS, October 14 and 15, Sheraton Hotel, Chicago—sponsored by the graduate school of Illinois

NICHOLSON

TRAPS for Every Plant Application



Send for Nicholson Catalog 953. This 32-page standard reference on advance-type trapping of steam, air and other mediums contains: installation diagrams, charts and formulae for determining proper trap sizes, and advice on solving specific problems. See why leading plants are increasingly standardizing on Nicholson traps for increased production and minimum maintenance.



Send for this Helpful Booklet

W. H. NICHOLSON & CO.
TRAPS · VALVES · FLOATS
198 Oregon St., Wilkes-Barre, Pa.

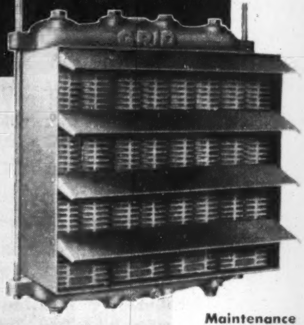
THE NATION'S

Leading Industries...

Use

GRID

Unit Heaters



and here's why . . .

Maintenance cost conscious management men turn to GRID for relief from the continuous expense of heating failures experienced with ordinary unit heaters. GRID service records established over years of operation in heavy industry prove GRID installation will provide adequate comfortable heat without constant service care. GRID Units installed in 1929 are still operating today . . . the only attention needed has been an occasional oiling of the motor. No ordinary unit heater can approach this record.

GRID's All-Cast construction having similar metals in contact with steam prevents electrolytic corrosion—GRID's ability to withstand steam pressures up to 250# P.S.I.—GRID's low outlet temperatures, proper fan sizes and motor speeds assure delivery of warm comfortable air in ample volume, directly to the spot where it is needed. These are the reasons why the nation's leading industries use GRID.

Get the full story—Write today.

ABBOTT LABORATORIES
ALLEGHENY LUDLUM
LOUIS ALLIS CO.
AMERICAN BRASS CO.
AMERICAN CHAIN & CABLE
AMERICAN CYANAMID
AMERICAN STEEL & WIRE CO.
ARMCO STEEL CORP.
ANACONDA COPPER MINING CO.
ARMOUR & CO.
ANSUL CHEMICAL CO.
B & O R.R.
A.T. & S.F.R.R. CO.
ARMSTRONG CORK CO.
CMSTP&P RR
BENDIX CORP.
BEATRICE FOODS
NEW YORK CENTRAL R.R.
BENZOL PRODUCTS
CANADIAN PACIFIC RWY. CO.
KRAFT FOODS
CHAIN BELT CO.
CHESAPEAKE & OHIO R.R.
MAINE CENTRAL R.R. CO.
CHICAGO NORTH WESTERN R.R. CO.
CHRYSLER CORP.
CLIFFS DOW CHEMICAL CO.
MARATHON CORPORATION
COLUMBIA SOUTHERN CHEMICAL CORP.
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CONSOLIDATED MINING & SMELTING CO., LTD.
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FORD MOTOR CO.
MONSANTO CHEMICAL CO.
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GENERAL CHEMICAL DIV. ALLIED CHEM. & DYE CORP.
HARSHAW CHEMICAL CO.
MASONITE CORP.
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HOFFMANN La-ROCHE INC.
GEO. A. HORMEL CO.
GENERAL FOODS CORPORATION
INTERNATIONAL HARVESTER
GENERAL ELECTRIC CO.
HOOKER ELECTRO-CHEMICAL CO.
MINN. & ST. LOUIS R. R. CO.
INLAND STEEL
MERCK & CO., INC.
ILLINOIS CENTRAL R.R. CO.
MATHIESON CHEMICAL CORP.
NATIONAL LEAD CO.
MINNESOTA MINING & MFG. CO.
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SHARPLES CHEMICALS
STAUFFER CHEMICAL
B. F. GOODRICH
SINCLAIR REFINING CO.
NORTHERN PACIFIC R.R. CO.
A. O. SMITH CORPORATION
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CARNEGIE ILLINOIS STEEL CO.
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UNITED STATES STEEL
VICTOR CHEMICAL WORKS
DAVISON CHEMICAL CORP.
CELOTEX CORP.
BORDON CO.
WESTINGHOUSE
WHEELING STEEL CORPORATION
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SWIFT & CO.
UNITED ELECTRIC COAL CO.
CUDAHY PACKING CO.
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YOUNGSTOWN SHEET & TUBE CO.
UNION CARBIDE & CARBON

D. J. MURRAY MANUFACTURING CO.
Manufacturers Since 1883 • Wausau Wisconsin

Representatives in all principal cities.

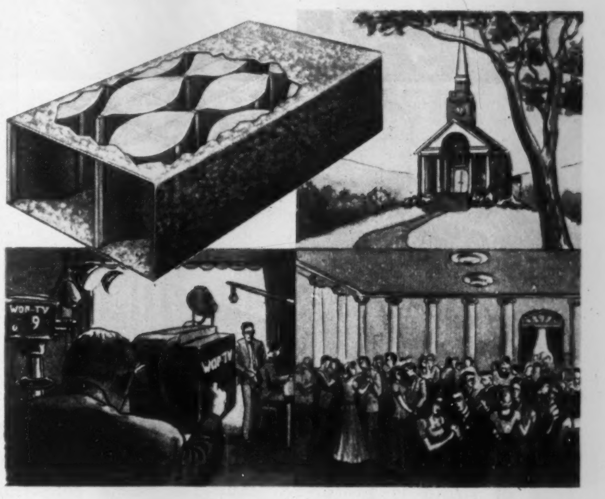
WHERE SILENCE IS AS IMPORTANT AS AIR CONDITIONING

specify *Aircoustat*

Whatever the location of your next air conditioning installation . . . ballroom, TV studio, church, hospital, office building, store or plant . . . if ***quiet*** *is required, Aircoustat offers the practical, economical solution to air conditioning noise!*

This compact, ***packaged*** *unit for silencing air and fan noise is easy to install. Incorporated as part of the duct work, it is attached by flexible connections . . . requires no special tools for installing.*

Aircoustat produces ***amazing*** *results. One* ***7 foot*** *unit, for example, reduces the noise level below what* ***100 feet*** *of old fashioned duct lining could accomplish . . . with low pressure drop. And selection is no problem. Aircoustat is so engineered that if it fits geometrically, it fits acoustically.*



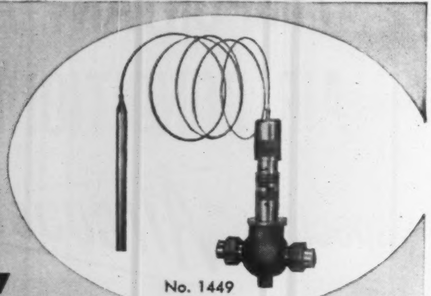
Constructed of galvanized steel or aluminum, Aircoustats are available in 11 standard sizes for use with all styles and sizes of ducts, and in 3 types to meet any desired conditions.

Write today for free descriptive literature.

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

new Klipfel
tank thermostat valve



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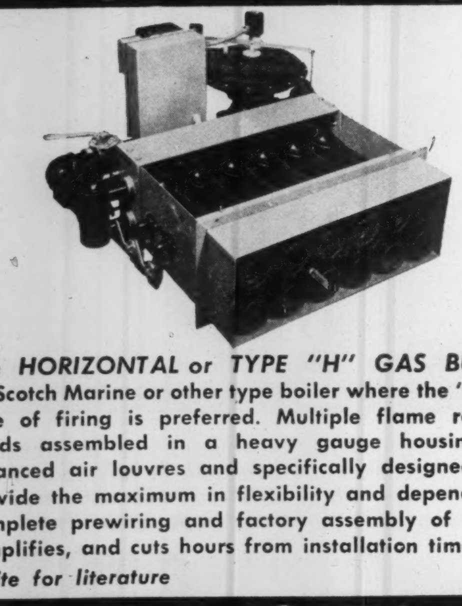
important advantages

- Long life hardened metal ball inner valve
- Trouble-free one-piece metal bellows
- Built-in overheat protection • Generous 50° adjustment range
- Quick, uniform throttling action • Positive, tight closing
- Wide selection of temperature ranges

For dependable, low-cost temperature control, select this NEW Klipfel Thermostatic Valve . . . perfected to give the service you want with accuracy, dependability and minimum maintenance.

Klipfel VALVES, INC.
1075 Lincoln Ave. Hamilton, Ohio
Export Office — 1010 Schaff Building, Philadelphia 2, Pa.

for Gas Firing



The HORIZONTAL or TYPE "H" GAS BURNER for Scotch Marine or other type boiler where the "Inshot" type of firing is preferred. Multiple flame retention heads assembled in a heavy gauge housing with balanced air louvres and specifically designed pilots provide the maximum in flexibility and dependability. Complete prewiring and factory assembly of controls simplifies, and cuts hours from installation time.

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WINFIELD, KANSAS

MEETINGS & CONVENTIONS

Continued

Institute of Technology and Armour Research Foundation of Illinois Tech. Automation and pneumatics will be featured sessions at the 10th annual meeting. Nine technical societies and 86 industrial sponsors cooperate in the presentation of the conference.

NATIONAL SAFETY CONGRESS AND EXPOSITION, October 18-22, Conrad Hilton Hotel, Chicago—sponsored by the National Safety Council, 425 N. Michigan Ave., Chicago 11. More than 200 sessions are planned to discuss the latest advances in accident prevention.

I-B-R SCHOOL OF MODERN HEATING— during October and November an intensive one-day course on baseboard series loop installations will be given. One-day courses are: October 19, Baltimore, Md.; October 21, Washington, D.C.; October 26, Long Island, N.Y.; October 28, Brooklyn, N.Y.; November 9, White Plains, N.Y.; November 11, Poughkeepsie, N.Y.; November 16, Utica, N.Y.; November 18, Syracuse, N.Y.

Tuition for the one-day baseboard course is $10. Further information may be obtained by writing to

WATER FILTERS

All of the outstanding qualities that have made MARVEL SYNCLINAL FILTERS the overwhelming choice in the filtration of hydraulic oils and other oil base liquids have been adapted to provide the same efficiency in the filtration of water.

Balanced Synclinal Design means longer periods of efficient filtration and productive operation.

STURDY CONSTRUCTION

to withstand use under rugged conditions, yet simple enough to allow any workman to easily disassemble, clean and reassemble on the spot, in a matter of minutes.

A SIZE FOR EVERY NEED

Available in line and sump type units in capacities from 5 to 100 G.P.M. Permanent type Monel metal insert ranging in mesh sizes from coarse 30 to fine 200.

Complete data and further information are contained in WATER CATALOG #300.

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SUMP TYPE (Cutaway)

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Marvel not only delivers a top grade filter in both quality and performance, but DELIVERS IMMEDIATELY. If desired, shipments are made on same day orders are received.

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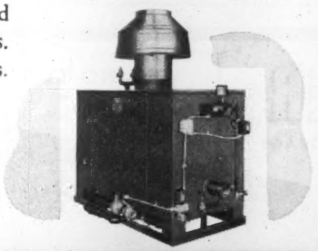
When you specify Parker you are recommending the finest hot water boiler available. Every unit, from 130,000 BTU to 3,300,000 BTU is complete in every detail, a packaged unit that is easy to install and economical to operate. Double-thickness steel all-welded tubing, fully insulated, and completely wired, factory fire-tested and equipped with the finest controls. Gas or oil fired models.



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FOR
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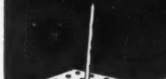
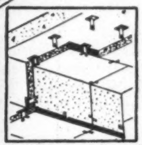
INSULATE
WITH
Miracle
SURFACE ANCHORS AND ADHESIVES





Miracle Surface Anchors bonded with Miracle Adhesives provide firm anchorage for all types of Insulation. This includes Batt, Fiber Glass, Foam Glass, Cork, etc. to ducts, walls, or ceilings. No drilling, welding, bolts, screws or other mechanical means of attachment required. Miracle Surface Anchors are available in a variety of shapes and sizes to accommodate the particular job, and have been endorsed by leading Insulation Contractors and Architects everywhere because of their labor and time saving features. For information write:

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The high-quality flexible spiral-wire reinforced hose

SIZES 1¼ in. to 36 in. ID

MOVE Air, Dust, Gases, Materials
BY Pressure, Suction, Gravity

Check these *Basic Economies:*

- ✓ **INSTALLED IN A HURRY**—Even by unskilled labor. Easy-to-connect accessories. Completely air-tight. No costly layout preliminaries.
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- ✓ **EASY TO MOVE**—Light, fully portable, completely flexible with negligible stress for moving collector heads.

For sizes, coatings, accessories, and flow characteristics... write for catalog today.

Your local distributor has Flexaust—as well as the companion ducting, *Portovent.*

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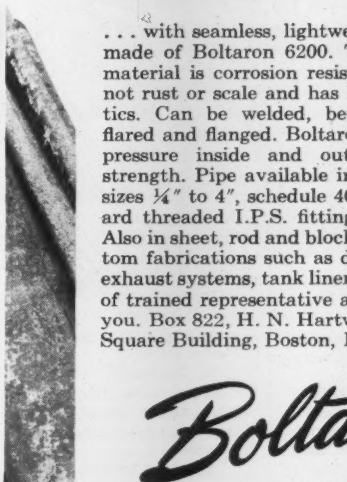
Formerly American Ventilating Hose Co.

FLEXAUST® PORTOVENT® BLOFLEX*

*Trade-mark

NO PIPELINE RUST OR CORROSION—EVER...!



... with seamless, lightweight pipe and fittings made of Boltaron 6200. This highly workable material is corrosion resistant throughout, will not rust or scale and has high flow characteristics. Can be welded, bent, sawed, threaded, flared and flanged. Boltaron withstands normal pressure inside and out, has good impact strength. Pipe available in 10′ and 20′ lengths, sizes ¼″ to 4″, schedule 40 and 80 wall. Standard threaded I.P.S. fittings in sizes ¼″ to 2″. Also in sheet, rod and block stock for special custom fabrications such as ducts, ventilating and exhaust systems, tank liners, etc. Write for name of trained representative and fabricator nearest you. Box 822, H. N. Hartwell & Son, Inc., Park Square Building, Boston, Massachusetts.

Boltaron® 6200

... rigid, unplasticized Polyvinyl Chloride

For **EXTRA SHOCK-RESISTANCE** ask about Boltaron 7200 *Greenline*

MEETINGS & CONVENTIONS

Continued

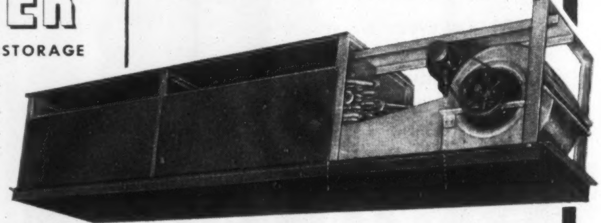
the new headquarters of the Institute of Boiler and Radiator Manufacturers, 608 Fifth Ave., Room 408, New York City.

PLASTICS IN BUILDING, conference stressing the importance of plastics in residential, industrial and institutional construction—October 27-28, National Academy of Sciences, Washington, D.C. Sponsors are the Society of the Plastics Industry, Inc., the Manufacturing Chemists' Association and the Building Research Advisory Board.

AMERICAN WELDING SOCIETY, 33 W. 39th St., New York 18—national fall meeting, November 1-5, Sherman Hotel, Chicago. Among the subjects to be discussed are the welding of titanium, zirconium and molybdenum, the use of welding in the production of aircraft and rockets, welding high temperature materials, inert gas shielded arc welding, etc.

The meeting will run concurrently with the *NATIONAL METALS EXPOSITION* to be held at the International Amphitheater.

AIR POLLUTION CONTROL ASSOCIATION, November 4-6, Biltmore Hotel, Los Angeles—semi-annual



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LOW VELOCITY UNIT COOLER FOR FOOD PROCESSING & STORAGE

Designed especially to conserve space, maintain proper temperature, produce even air motion, and reduce shrinkage. COLDMASTERS are ideal for multiple-unit installations. Available for ammonia, or for Freon, in galvanized or stainless steel.

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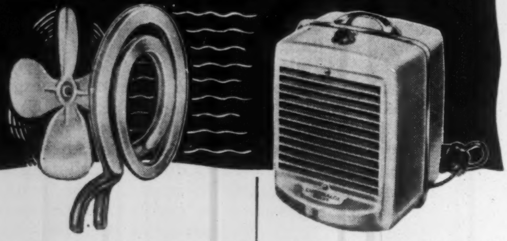
CEILING TYPE • HEAVY DUTY

COLDMASTERS are for use wherever refrigeration with extremely low air velocity is required.



FOR "EXTRA" COMFORT HEAT
At Low Cost
CHROMALOX Blower-type Electric UNIT HEATERS

Whatever your comfort heating requirements, there's a CHROMALOX Electric Unit Heater that fits the picture exactly. Portable, mounted, built-in—blower-type, natural convection or radiant types—¼ to 40 KW. All with famous, long-lasting CHROMALOX totally enclosed heating elements. CHROMALOX quality construction throughout. Available with automatic and manual controls.

- Enclosed, Shockproof Chromalox Heating Element.
- Quiet, Dependable.
- Long Service Life.
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- A Size and Type for Every Requirement.

WRITE FOR CATALOG 50
It shows complete line of Unit Heaters of portable, mounted and built-in-wall types.

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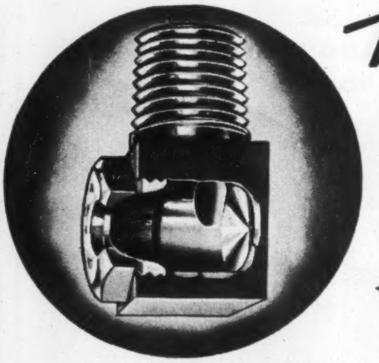
ELECTRIC HEATING AT ITS BEST!



Monarch NOZZLES for AIR WASHERS

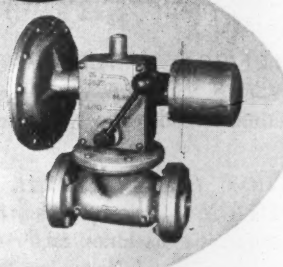
These are "non-clogging" nozzles with a single large tangential lead hole to the swirl chamber that will never clog from any impurities small enough to pass through the orifice. Swirl chamber is conical on both ends and pivots liquid like a top to produce an exceptionally fine, evenly distributed, balanced spray of about 80° included angle. Wider spray angles up to 130° can be furnished to order.

Standard material Brass. Also available in Stainless Steel and Monel. Pipe sizes from ⅛" to 1". ¼" size is 1-5/16" long and made from ⅝" square stock.

Write for Catalog 6-A

Monarch MFG. WORKS, INC.
2523 E. ONTARIO ST.
PHILADELPHIA 34, PA.

Canadian Agents: (Except B.C.)
Canadian General Filters Ltd., Toronto 16, Canada



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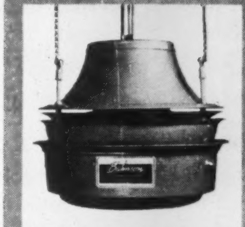
Recommended by safety engineers!

Now . . . Eclipse safety shut-off valves in new larger sizes!

With the *new* 4" and 6" sizes, Eclipse *Lock-Tite* Valves are now available for a complete range of work! If you want *multiple-control* for *instantaneous* safe shut-off . . . on combustion equipment you make or use . . . investigate Lock-Tites. With *five* different actuating units, they give you *complete protection* against pressure and electrical failures . . . safeguard your equipment and personnel under all conditions! Write for Bulletin M-302.

Eclipse Fuel Engineering Co., 1139 Buchanan Street, Rockford, Ill.
Eclipse Fuel Engineering Co. of Canada, Ltd., Toronto, Ontario

Complete line of
Eclipse Valves
Write for Bulletin "M"



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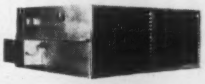
BAHNSON HUMIDIFIERS

A TYPE FOR EVERY INDUSTRIAL NEED

TYPE E: Quickly installed; evaporates up to 3 gph with ¼ hp motor; ideal for small areas.



TYPE BA: Extremely versatile, for large areas. Water or steam units with capacity to 30 gph.

- **Fully automatic**
- **Trouble-free**
- **No floor space**
- **Any capacity**
- **Free, complete engineering service**

Write for specific recommendations, or get details on complete line in Catalog H-3.

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COMPANY
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AIR CONDITIONING • HUMIDIFICATION

VIBRATION PROBLEM?

ENGINEERS AND SERVICEMEN! Are you confronted with vibration and noise problems in compressor lines? If so, specify PACKLESS Flexible Vibration Absorbers for the answer. Size range to fit ¼" O.D.—10⅛" O.D. copper tubing.

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METAL HOSE INC.

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BILTON PUMPS

. . . WITH BJ MECHANICAL SEAL AS STANDARD EQUIPMENT!

Meet the mighty midgets of the BJ Bilton family. They offer capacities up to 100 GPM and heads up to 100 ft. . . . yet the largest measures only 16 inches in length! Mount in any position . . . need no base plate . . . pump case may be rotated for horizontal or vertical discharge . . . no stuffingbox problems. Temperatures to 150° F and suction pressures to 75 psi can be handled. Quick delivery.

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- *Swimming pools*
- *Building service*
- *Refrigeration*
- *Coolant oil*
- *Car washing*
- *Fire protection*
- *and countless other general purpose pumping jobs*

Byron Jackson Co. PUMP DIVISION
P. O. Box 2017, Terminal Annex
Los Angeles 54, California
Quality Pumps Since 1872

MEETINGS & CONVENTIONS *Continued*

technical conference dealing with details on installations of air pollution control devices. Advance registration should be made with Edward S. Feldman, 2155 E. Seventh St., Los Angeles 23.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—fourth annual conference of the Western Region, November 18-19, Hotel Biltmore, Los Angeles. The conference will follow a short course at the University of California. Technical sessions include marine and steel water pipe corrosion problems and the uses of concrete and bituminous coatings on water piping. Registration chairman is J. G. Kerr, C. F. Braun & Co., 1000 S. Fremont Ave., Alhambra, Calif.

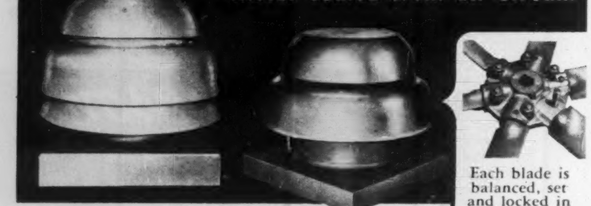
AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 234 Fifth Ave., New York 1—50th annual meeting, Philadelphia, November 28-December 1.

FIRST INTERNATIONAL AUTOMATION EXPOSITION, 845 Ridge Ave., Pittsburgh 12—exhibit on automatic machines, factories and industries to be held the week of November 29 at the 242nd Coast Artillery Armory, 14th St. off Sixth Ave., New York.

The exhibit is under the direction of Richard Rimbach.

21st *NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING*, under the management of the International Exposition Co., 480 Lexington Ave., New York 17—Commercial Museum, Philadelphia, December 2-7. The dates were arranged during the period of the 74th annual meeting of the *AMERICAN SOCIETY OF MECHANICAL ENGINEERS*, under whose auspices the exposition will be held. On Monday, December 6, there will be a joint meeting of the Philadelphia chapters of the American

COOK VENTILATORS
now with BLOWER or PROPELLER
Easy to install • All aluminum • Low silhouette
Motor sealed from air stream

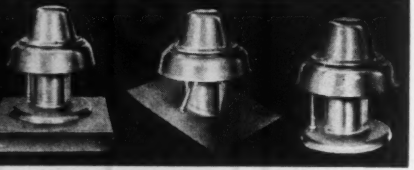


Each blade is balanced, set and locked in proper pitch by taper-pin bolt.

Blower type, Model BV from 9" to 21". Backwardly inclined impeller, non-overloading.

Propeller type, Model FV from 12" to 24". Thousands of Cook-built propellers are in daily use.

7", 9" or 10" Blower Roof Ventilator Model R



Model R with square base

Model R with slope base

Model R with round base

All models direct drive . . . damper optional

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Duct Fan
Exhaust Fan
Man Cooler
Roof Ventilator

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FOR EVERY INDUSTRIAL USE

The "Ornamental" light-gauge designs here illustrated are only a few of the many you can choose from in our new Catalog 39 and we are always pleased to quote on original designs or special work of any kind.

For larger unit-openings, using metals up to ¼" in thickness, we offer a wide variety of equally attractive designs in our Catalog 36 on Diamond Architectural Grilles.

Send us your blueprints. We are equipped to fabricate special sections to any desired extent and welcome opportunities to make money-saving suggestions.

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Box 45 WYOMING PENNA.
(Wilkes-Barre Area)

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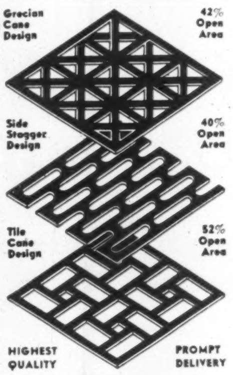

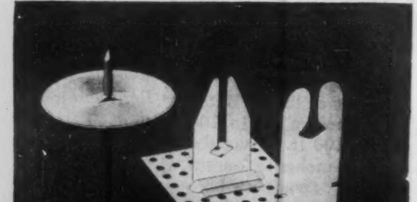

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For Fast, Economical Application

Fiberglas, air cell board, mineral wool sheets, cork, magnesia — there's a Stic-Klip and method of application for almost every insulating material. The Stic-Klip method is perfectly adapted for flat, round or unusually-shaped surfaces, either masonry, wooden or metallic. Eliminates drilling, puncturing metal and provides a permanent bond. Stic-Klip applications have been extensively used to insulate —

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- Cold Storage, Acoustical and Marine Installations

Write Dept. HP for illustrated booklet on any of these durable applications of Stic-Klip.

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MANUFACTURING COMPANY, INC.
50 Regent Street, Cambridge 40, Mass.

MEETINGS

Continued

Society of Mechanical Engineers and the American Society of Civil Engineers at Convention Hall.

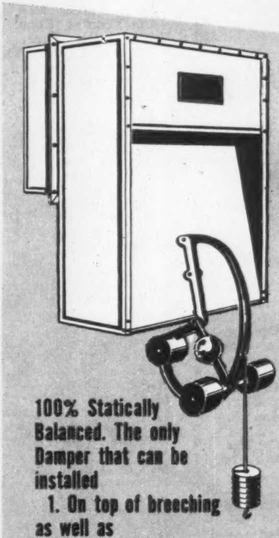
AMERICAN SOCIETY OF HEATING & VENTILATING ENGINEERS, 62 Worth St., New York 13—61st annual meeting, January 24-27, 1955, Benjamin Franklin and Bellevue-Stratford Hotels, Philadelphia.

INTERNATIONAL HEATING & VENTILATING EXPOSITION—The Air Conditioning Exposition, January 24-28, 1955, Commercial Museum & Convention Hall, Philadelphia. Under the auspices of The American Society of Heating and Ventilating Engineers, and under the management of the International Exposition Co., 480 Lexington Ave., New York 17. Every known method of moving and conditioning air, as well as engineering materials and mechanical components, will be demonstrated.

McINTYRE-SARANAC CONFERENCE, February 7-9, 1955, Town Hall, Saranac Lake, N.Y.—conference on silicosis and occupational chest diseases jointly sponsored by the McIntyre Research Foundation of Toronto and the Saranac Laboratory. Write c/o the conference, P.O. Box 551, Saranac Lake, N. Y.

NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6—46th annual meeting, Edgewater Beach Hotel, Chicago, May 23-26, 1955.

9th EXPOSITION OF THE AIR-CONDITIONING AND REFRIGERATION INDUSTRY, Atlantic City, November 28-December 1, 1955—sponsored by the Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington, D.C. The name of the trade show, formerly the All-Industry Refrigeration and Air Conditioning Exposition, has been officially changed.



100% Statically Balanced. The only Damper that can be installed
1. On top of breeching as well as
2. On side of breeching
3. Under breeching
4. At base of chimney

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- Ventilates Boiler Room
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PREFERRED UTILITIES MFG. CORP.
EQUIPMENT FOR AUTOMATIC HEATING AND POWER
1860 H Broadway • New York 23, N. Y.

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Rates for classified advertising are 15 cents for each word, including heading and address. One inch $7.00. Count nine words for keyed address. Minimum $2.50 .

agents wanted . . .

Exclusive territorial franchises Connecticut; Peoria — Springfield, Illinois area; South Bend, Kalamazoo, Grand Rapids, Michigan area; Montana; Eastern Wisconsin and British Columbia available for established representatives handling our heating and ventilating units, air conditioners, heating and cooling coils, unit heaters, other heat transfer products. A leader in the industry for over 20 years. McQuay, Inc., 1600 Broadway, N.E., Minneapolis 13, Minnesota.

Manufacturer's Agents required by well known manufacturer of STEAM, GAS AND OIL FIRED UNIT HEATERS. HEATING AND VENTILATING UNITS. CONVECTOR RADIATORS. Territories open in several sections of the United States. Airtherm Manufacturing Company, 711 South Spring Avenue, St. Louis 10, Missouri.

miscellaneous . . .

STEAM COILS @ BIG SAVINGS. Large stock of copper blast coils in stock for heating. Send for current stock list. AIR CONDITIONING ENGINEERING CO. CAMBRIDGE 41, MASS.

lines wanted . . .

Established Mfrs. Agents, NEW ENGLAND TERRITORY, wish to add to present lines a major line of heating, ventilating or air conditioning equipment. Twenty years experience, good reputation. Address Key 1120A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

situation open . . .

INSULATION ENGINEER — Excellent opportunity and permanent position with reliable firm. To qualify, you must be capable of managing, estimating and supervising labor on insulation work for industry, power houses and commercial buildings. Write, giving full particulars including education, experience, personal details and salary requirement to The Philip Carey Mfg. Company, Lockland, Cincinnati 15, Ohio.

Project Engineer — Graduate — Development of Electrical and Mechanical Device — Minimum 5 years experience. Electrical Project Engineer — Graduate — Experience in motor design, electrical components and electrical appliance essential. Also required several assistant project engineers — Degree — Industrial experience helpful but not necessary. Send complete resume and salary requirements. All replies confidential. Eureka Williams Company, Bloomington, Illinois.

Assistant to Chief Mechanical Engineer of Engineering and Contracting Company doing Industrial Piping, Plumbing and Heating in Middle West. Desire estimating experience. Give experience, education, photo and salary expectations. Address Key 1108A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

ENGINEER, 22 to 35, graduate of recognized college. Unusual opportunity in air conditioning field with a young, expanding firm in a prosperous, growing community. Require top caliber for eventual key position. No experience in our field required but will be considered. Furnish resume of education, scholastic standing, experience, and earnings. State starting salary you believe you can justify. Furnish a good picture of yourself. All replies will be held confidential. Write Air Engineers, 125 South Eighth Street, Allentown, Pennsylvania.

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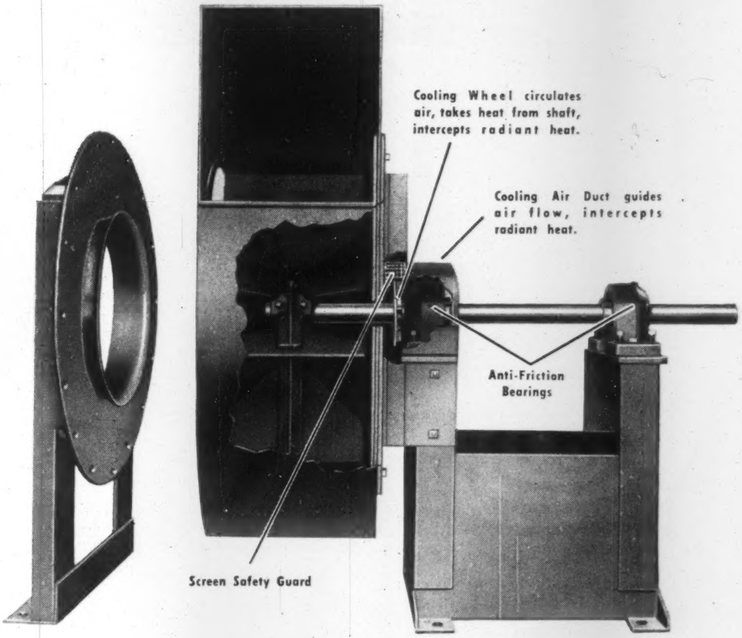
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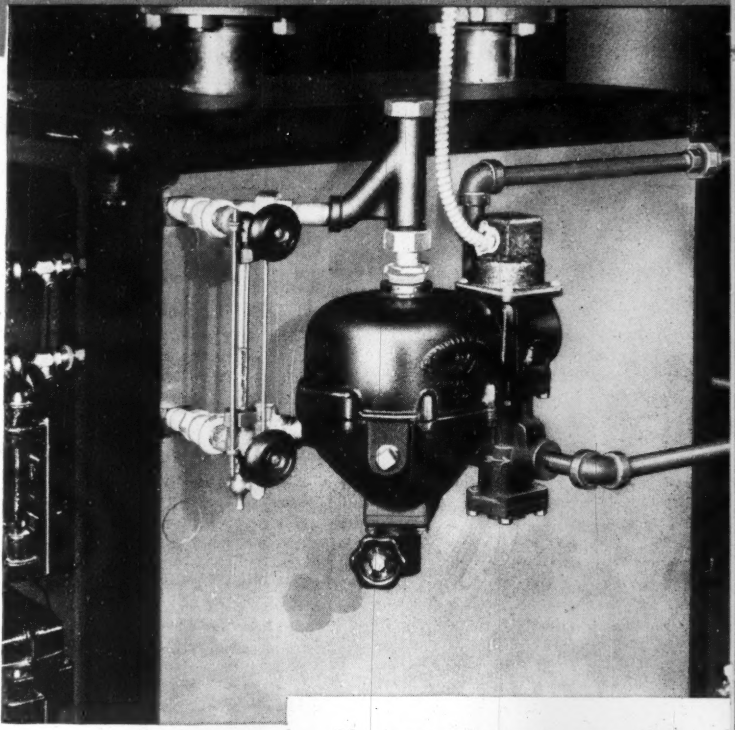
Here's our stand on those automatically fired steam boilers



THIS IS IT → → → →

Heating men keep wanting to know why we always recommend a combined water feeder and low water cut-off for all automatically fired boilers. Why, they ask, doesn't a simple low water cut-off fill the bill just as well?

The answer is that we wouldn't keep on making the best low water cut-off that money can buy if we didn't think it was a *good* idea; and, by the same token, we wouldn't keep on recommending a feeder-cut-off combination if we didn't think it was a *better* idea.

From any standpoint — safety or convenience — the combination is best because the two can accomplish more working together than either can alone. They compliment each other perfectly because the feeder gives *mechanical* protection and the cut-off gives *electrical* protection.

As brought out opposite and below, the feeder ordinarily functions as the first line of defense from low water — takes care of all normal operation of the boiler — and the low water cut-off stands by for the emergency as the last line of defense. Certainly the low water cut-off would be the final defense, if prolonged and extreme priming or foaming occurred or if the water supply failed. But just the same there are times when the feeder may save a boiler that the low water cut-off could not save . . . on a stoker fired boiler, for instance, where interrupting the current merely stops the blower, but permits some firing to continue; or on a gas-fired boiler if the electric valve failed to operate.

Yes, your first recommendation for every automatically fired boiler should be a feeder-cut-off combination; not because it is more profitable for you, but because it is best for your customer. If the boiler owner refuses to pay for the combination, next best choice of course is a McDonnell Low Water Fuel Cut-off.

McDONNELL & MILLER, INC.
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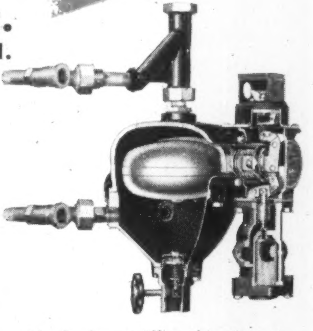
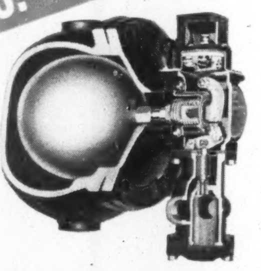
Doing One M&M SAFETY CONTROLS *Thing Well*

No. 47-2



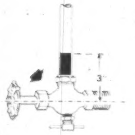
The feeder-cut-off combination at its best, McDonnell No. 47-2 for automatically fired boilers up to 5000 sq. ft.; maximum steam pressure, 25 lbs.

No. 51-2

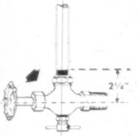


This feeder-cut-off combination operates exactly the same as the No. 47-2, but has the greater capacity required by boilers above 5000 sq. ft.; maximum steam pressure, 35 lbs.

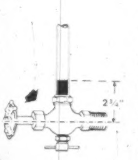
The operating sequence that makes the boiler water level as automatic as the firing . . .



1 The feeder (mechanical control) takes care of all normal operation — feeds make-up water only when needed and as much as needed.



2 But if an emergency occurs, such as extreme priming and foaming, or any other condition arises so that the feeder can not keep up with feeding requirements, the switch (electrical control) interrupts the current to the burner.



3 As soon as the emergency has passed the control is returned to the feeder. This is the fully automatic sequence of operation that is possible only with a feeder-cut-off combination.

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